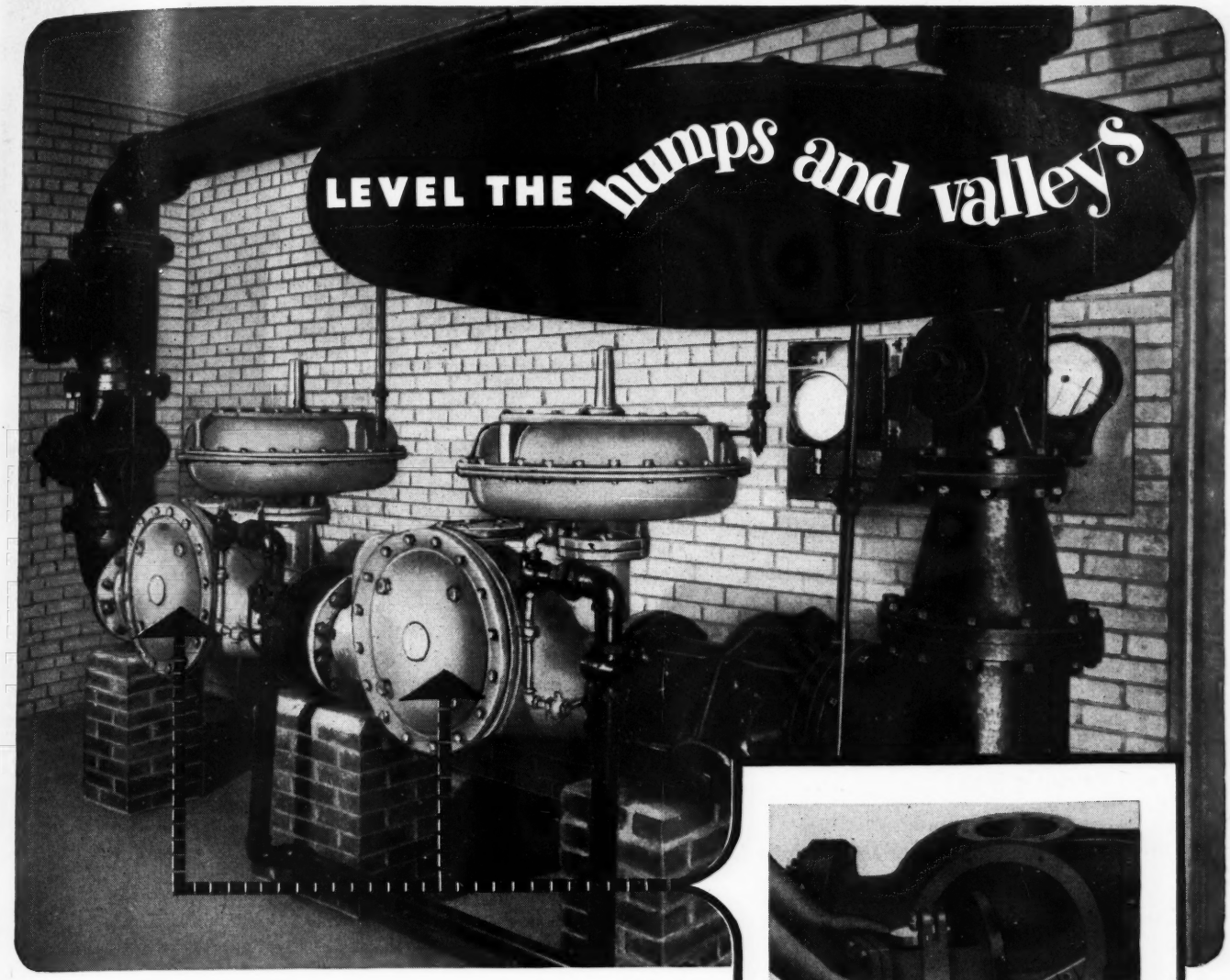


Rockwell regulation does it!

When you buy Rockwell low pressure regulators you get the advantage of an exclusive internal long lever design that quickly compensates for variations in outlet pressure.

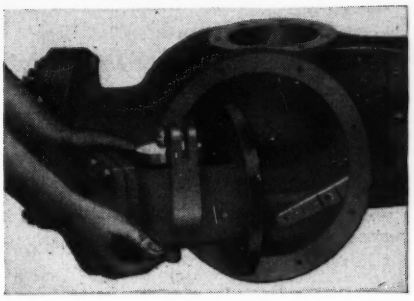
You get a powerful, positive shut-off against a soft resilient valve seat. Since there are no stuffing boxes you gain freedom from binds and premature wear.

A selection of generous diaphragm sizes further insures the highest degree of sensitivity and accuracy in control. All this *plus* a removable inlet bowl (valve chamber) assembly that permits the widest latitude in sizing your regulators. **Write for bulletin *1006*.**

ROCKWELL MANUFACTURING COMPANY

PITTSBURGH 8, PA.

Atlanta Boston Chicago Columbus Houston Kansas City Los Angeles
New York Pittsburgh San Francisco Seattle Tulsa



REMOVABLE INLET BOWL FEATURE

In low pressure distribution it is essential that regulator sizes be closely adapted to volume requirements. In the Rockwell regulator this is easily accomplished by means of a removable inlet bowl. Any inlet bowl can be assembled in a regulator of larger size by mounting on an adaptor ring and bolting into the body. For example, a 2" or 4" inlet bowl can be used in a 6" Rockwell regulator. Should changing conditions of pressure or volume make it desirable, this replacement can be made with the regulator in the line.

ROCKWELL REGULATORS

EMCO

Contents

APRIL 1951 • VOLUME XXVII • NUMBER 4

Designing a Distribution System to Accommodate Future Expansion 31
By Herbert M. Dwight

3500 Zipcoats Speed Laying of Indianapolis Utility's Line 36

Selecting Insulating Fittings for Junctures of Copper to Steel in Mains and Services 38
By Gordon G. Dye

How Cathodic Protection Was Applied to the Underside of a Water-Seal Holder 41
By E. H. Grebstad and T. H. Gilbert

Applying Electrical Tape for Welded Joint Protection and Patching Jobs 44
By Edward S. Siegel

How Four Utilities Cooperate to Reduce Leakage 46
By R. W. Miller

Camouflaged Stations Keep Denverites Happy 49
By Robert H. Taylor and A. M. Christensen

Four-Step Program Helps Oklahomans Upgrade Househeating Installations 52
By Earle E. Garrison

Security . . . At the Company Level 54
By Gordon G. Dye

Record Natural Gas Production Fails to Match 1950's Gains in Proved Reserves 60

• PIPELINE SECTION

One-Way Gas Traffic 95

Skid-Mounted Solid Dessicant Dehydrators Built for Transco 102
By C. B. Ames

Peoples Optimistic Over Storage Prospects 105

Compressor Head Lifter Saves Time, Labor 106

• COMMENT

Highlights 23
Technical Trends, by Guy Corfield 29
Thermally Thinking 25

• DEPARTMENTS

News 62
Associations 71
Calendar 76
Trade Literature 78
Current Reading 80
People 82
New Products 88
Pipeline News 108
Progress Reports 118
Advertisers Index 122

A JENKINS PUBLICATION

EXECUTIVE
JAY JENKINS, President and Publisher
PAUL LADY, General Manager
D. NEWLON, Advertising Manager
JAMES E. JENKINS, Secy.-Treas.
R. C. HORTON, Circulation Manager

EDITORIAL
BILL CLARK, Managing Editor
GUY CORFIELD, Technical Editor
LARSTON FARRAR, Washington Editor
M. L. HANSON, Editorial Assistant
O. D. HALL, Mid-Continent Editor
FREDERICK L. DALTON, Art Director

PUBLICATION OFFICE
198 South Alvarado St.
Los Angeles 4, California
Phone DUnkirk 7-4337

BRANCH OFFICES

CHICAGO
DAVID CARMEN, District Manager
1064 Peoples Gas Building
WAbash 2-2589

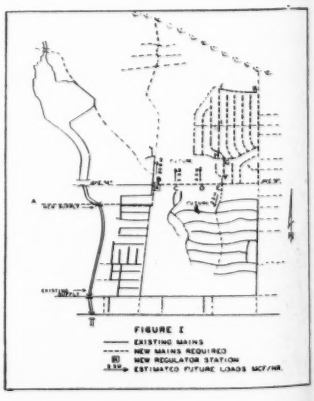
CLEVELAND
JAMES K. GILLAM, District Manager
19718 Lanbury Ave.
WYoming 1-2587

NEW YORK
RAYMOND M. SCHUSTER, District Manager
11 West 42nd St.
CHickering 4-1969

TULSA
CRAIG ESPY, District Manager
P.O. Box 4055
2-2414 (bus.), 7-9807 (res.)

GAS is published monthly by Jenkins Publications, Inc., 198 South Alvarado Street, Los Angeles 4, California. Subscription price, United States and possessions (in advance), 50 cents per copy; one year $2.00; two years $3.00. All other countries, one year $4.00; two years $7.00. Acceptance under Section 34.64 P. L. & R. authorized. Member: The Controlled Circulation Audit, Inc.; National Business Publications, Inc. GAS is indexed regularly by Engineering Index Inc. Publishers: BUTANE-PROPANE NEWS; Handbook BUTANE-PROPANE GASES; BOTTLED GAS MANUAL; WESTERN METALS. The name "GAS" is registered, U. S. Patent Office.

IN THIS ISSUE



SOLUTIONS to distribution design problems such as this are given on pp. 31-35.

Thermally Thinking

the editors

Johnson's Surprised

SENATOR EDWIN C. JOHNSON (D. Colo.) has taken to the Senate floor to express his "surprise" at the dissent of Federal Power Commissioner Thomas C. Buchanan in the case in which FPC authorized Colorado Interstate Gas Co. to acquire and to operate the facilities of Canadian River Gas Co.

"I disagree completely with respect to his (Buchanan's) pessimistic conclusions," the Senator told his colleagues. "All of the points which he raises were before the commission and they were rejected on their merits.

"The important point, which Mr. Buchanan apparently has failed to grasp, is that an adequate supply of gas for Colorado consumers, and not the price of gas, is the issue in this particular matter. Denver now enjoys, and will continue to enjoy under the merger, lower natural gas rates than many other cities. For example, in 1949, the Denver home owner who heated his house with gas and who used 20 Mcf of gas monthly—a typical bill—paid 43.8 cents per Mcf, or a total of $8.87. This is in startling contrast to the Fort Worth, Texas, family, deep in the heart of the gas and oil country, who paid 59.8 cents per Mcf, or $11.97 for 20 Mcf. Colorado Interstate's wholesale rate at the Denver city gate, 17.1 cents per Mcf, is one of the lowest rates in the entire country."

In his one-man dissent from the FPC's March 1 decision authorizing the Colorado Interstate—Canadian River merger, Commissioner Buchanan said it was "because (1) in my opinion the decision unjustifiably deprives the gas consumers of Denver, Cheyenne, and the Rocky mountain area of a saving in gas rates of approximately $800,000 on an annual basis, and (2) the decision is completely at odds with fundamental principles of regulation vigorously espoused by this commission and approved by the U. S. Supreme Court."

In his 20-page dissent, Mr. Buchanan reviewed in detail the history of the two companies and the merger plan, under which Colorado is acquiring Canadian from Southwestern Development Co. through a plan which will, among other things, give Southwestern title to all liquid hydrocarbons associated with the natural gas underlying Canadian's acreage.

Mr. Buchanan asserted that the merger is entirely one of increased gains for the stockholders. He said that Southwestern will receive more than $20 million from natural gas revenues, while the value of its stock holdings, which cost it nothing in the first instance, will be increased by several million dollars.

"I am not objecting to Colorado's stockholders making a profit from the sale of their stock holdings," Mr. Buchanan asserted. "That is one of the privileges of our free enterprise system. But where free enterprise and the public interest come into conflict through a public utility which Congress has expressly made subject to regulation, the situation is different and the congressional policies must prevail without choice.

"This is the first instance, to my knowledge, where a regulatory agency has sanctioned the diversion of operating revenues to pay for the stock of another utility corporation. Colorado's customers will continue to pay a fair return and depreciation on Canadian's investment of approximately $9 million but in addition, will have to pay Colorado's cost of acquiring Canadian's stock amounting to more than $20 million. In my opinion, this is an unreasonable and unconscionable burden on the gas consumers of Denver, Cheyenne, and the Rocky mountain area.

"My dissent does not mean that I am opposed to a merger if the public interest were fully protected. Quite the contrary. A merger in the customary or orthodox sense, without the diversion of Colorado's operating revenues to Southwestern as payment for Canadian's stock, would have been in the public interest. No such proposal, however, is before us."

Eminent Domain vs. Eminent Domain

LEGAL PROTECTION for a gas pipeline company's easement was upheld recently in Minnesota when the state supreme court reversed the decision of a district court and granted entitlement of damages to the injured company.

The appellant in the case was Northern Natural Gas Co. of Omaha. The respondent was Blue Earth county, Minn. The point of law centered upon a ditch.

In 1939, Northern Natural laid a 16-in. pipeline through the watershed area which this ditch (county ditch No. 78) is intended to drain. Right to lay the line was obtained through easements secured by private grant. At two of the places where the line intersects the proposed ditch, there was at that time a public ditch which had previously been constructed by the county; at one point it consisted of a 16-in. drain tile, at the other there was a 3-ft. open ditch. At the third intersection there was a privately owned ditch and tile drain. So, in order to prevent interference with existing drainage, Northern Natural had laid its line 3 ft below the bottom of the 3-ft open ditch and 4 to 5 ft below the ground level at the other locations.

In 1948, county ditch No. 78 was authorized, to furnish drainage for 10,000 acres of agricultural land. It will replace the existing drainage facilities at the three locations, and being larger and deeper requires relocation of the pipeline.

The "viewers" awarded no damages to Northern Natural. The company appealed to the district court, which dismissed

the appeal upon the ground that it was the company's "uncompensated duty to reconstruct its pipeline to accommodate itself to the ditch." Northern Natural appealed to the highest state court.

Argued Northern Natural:

It has the same right and privileges in the state as a domestic corporation; it has the power of eminent domain by act of Congress; when Blue Earth county established the ditch it was exercising *its* power of eminent domain, and that the company's property was being taken or damaged for public use; an easement *is* property; and that while the county was not physically "taking" the property, it was "impairing" it.

Argued the county:

Appellant's easements were subject to the natural right of drainage, which right was part and parcel of the lands to be drained and one that grantors of the easement did not and could not convey; that when the lines were laid, Northern Natural was told the drainage facilities might some day be enlarged.

Northern Natural's arguments were deemed valid, and the company won the appeal.

Here Come Price Controls

OFFICIALS of the Office of Price Stabilization have discussed with its new industry advisory committee on liquefied petroleum gas and natural gas and natural gasoline the probability of revising current price controls in effect on those commodities.

OPS officials told the industry representatives the price agency is considering a new regulation designed to eliminate price distortions and yet to maintain effective price controls. They emphasized that the new regulation would *not* be designed to allow general price increases.

Prices on these products generally were frozen by the General Ceiling Price Regulation, issued Jan. 26, at the highest levels they reached between Dec. 19, 1950, and Jan. 25, 1951.

OPS petroleum experts pointed out that they felt a revision of the GCPR may be necessary because of the peculiar nature of the industries involved. They pointed out that some industry contracts, particularly those dealing with natural gas, are made to extend for periods as long as 15 or 20 years.

The regulation discussed was one of several under consideration. All are specially designed to allow the affected industries to return to their traditional trading practices. OPS hopes to have the regulations ready for issuance soon.

The meeting was conducted by O. D. Judd, chief of the OPS petroleum branch, assisted by Arthur W. Phelps, one of his deputies, and Stephen J. Angland, OPS counsel.

A number of gas industry executives were present at the meeting, and, in fact, were notified officially of their appointment to the OPS industry advisory council.

Washington's Rate Hopes Dim

WASHINGTON INSIDERS believe that the U. S. Supreme Court is going to turn down the Washington (D.C.) Gas Light Co. and refuse to hear a case which the company has striven to appeal. The company is petitioning for a Supreme Court hearing on a rate increase granted by the District of Columbia Public Utilities Commission, but reversed by a lower court and the U. S. Court of Appeals.

Vernon A. West, the Interstate Commerce Commission lawyer who fought the company as a representative of a Washington citizens' group on the rate increase, has filed briefs with the Supreme Court disputing the company's contention that the case is of great national importance and involves any new legal precedents. He maintains that the lower courts acted strictly within the law and that there is no reason why the Supreme Court should hear the utility's appeal.

Supreme Court Lends an Ear

THE SUPREME COURT *has* granted a review in the case of the Panhandle Eastern Pipe Line Co. versus the Michigan Public Service Commission. Previously, the Michigan Supreme Court had upheld the right of a state public service commission to regulate the direct sale of natural gas by a pipeline to an industry, thus blocking an effort by Panhandle to sell gas directly to the Ford Motor Co. at its Dearborn, Mich. plant.

The Ford plant is located in a community served by Michigan Consolidated Gas Co., which purchases some of its gas from Panhandle. Michigan Consolidated had filed a complaint with the state public service commission against the invasion of its distribution territory by Panhandle, and the Michigan Public Service Commission agreed with the local company.

Observers expected the Supreme Court to hear the Panhandle versus Michigan Public Service Commission case, since it involves some entirely new points of law not hitherto explored.

The majority opinion of the Michigan Supreme Court stated that the pipeline company was seeking to "skim the cream off the local market for natural gas . . . without regard to the public convenience and necessity for natural gas by other users in the Detroit area.

"If Panhandle is free to compete at will for such local markets, and take the cream of the business, any other utility providing the same service in the same area might be forced to obtain higher rates for its services when it must obtain its natural gas from Panhandle, and thus would face a distinct disadvantage," the Michigan Supreme Court majority opinion continued.

"The right to sell natural gas in this state by Panhandle direct to consumers for their own use and not for resale, in a municipality where another public utility is rendering the same sort of service, is within the jurisdiction of the Michigan Public Service Commission. Any other conclusion would allow Panhandle to engage in such business without either federal or state control over the right to engage in such service. It has long been the general policy of the law that a public utility should be subjected to governmental control."

Steel for Production

A PRODUCTION PROGRAM designed to provide steel casing, tubing and drill pipe for drilling oil and gas wells at a rate of 43,400 annually has been established, effective in April, for the oil and gas industries, the National Production Authority has announced.

It is estimated that this program will require 157,000 tons of these steel products monthly. These wells must be drilled, NPA said, to tap new supplies of oil and gas to provide the products needed for defense and essential civilian needs.

Simultaneously, Secretary Chapman announced that forms by which oil and gas operators may obtain oil-country tubular goods under NPA's Order M-46 already have been distributed to the petroleum and gas industry in order to permit formation of a priorities assistance program as soon as possible.

NPA said that it would issue directives under which mills will be able to provide steel for the program.

Technical Trends

guy corfield

Large Fires Of 1950

THE NATIONAL FIRE PROTECTION ASSN. in its quarterly publication dated January 1951, has analyzed "Large Loss Fires of 1950 and Their Lessons" and brought out some points of interest. Two hundred and forty-three fires in the U. S. and Canada caused losses of $250,000 or more each, and produced a total loss of $152,593,000. One-half of one per cent of these fires were responsible for 20% of the total loss. While 61% of the fires started from unknown causes, 68% of the fires of known cause could have been prevented if the hazard responsible for the fire had been properly safeguarded. Thirty-one per cent were caused by acts of human carelessness.

The principal structural deficiencies influencing the fire spread were:

Insufficient fire division walls.
Open stair wells.
Inferior combustible construction.

The principal detection deficiencies were:

No sprinkler protection.
No automatic detection.
No watchman service.

In an analysis of the contents of the buildings as contributing to the fire, it was mentioned that in only six cases was there a natural gas line rupture or leak.

The principal contributing human factor was that the occupants delayed turning in the alarm while attempting to fight the fire themselves.

The most important public fire department deficiencies or handicaps were:

Insufficient equipment.
Insufficient manpower.
Inadequate volume of water at hydrants.
High or adverse winds.
Heavy smoke, or explosion during fire.
Necessity of concentrating on protecting adjacent exposed structures.

Gas Tug-of-War

THE REPEATED EFFORTS to move natural gas from the Canadian province of Alberta to the Pacific Northwest have now become literally a tug-of-war, as Representative Mitchell of the State of Washington has asked U. S. Defense Mobilizer C. E. Wilson to declare importation of natural gas from Canada to the Pacific Northwest vital to the security and defense of the continent. Previously the Alberta Conservation Board had ruled that no permits for export would be permitted until reserves of at least 4½ trillion cu ft have been proven. No immediate decision is anticipated, but this latest move could conceivably hasten a favorable decision.

Meanwhile these new Canadian petroleum resources are not escaping development along other lines, as typified by the announcement that Celanese Corp. of America is planning construction and operation of a large petrochemical and cellulose acetate plant near Edmonton, which will be named Canadian Chemical Co. Ltd. This plant will use the propane and butane fractions from present natural gas production to make formaldehyde, methanol, propylene glycol, acetaldehyde, acetic acid, acetone, etc., which, it is stated, will materially accelerate the defense program of both Canada and the U. S.

Plastic For Distribution

WITH THE INCREASING UNCERTAINTIES of world affairs and the "calculated risk" which this nation has chosen to assume, those responsible for gas industry operations are again, as in the last war, faced with unpredictable material shortages together with increasing demand for gas service. One of the most serious shortages in gas distribution materials will be piping for services and mains. Steel is becoming uncertain and copper may already be virtually unobtainable for non-defense purposes.

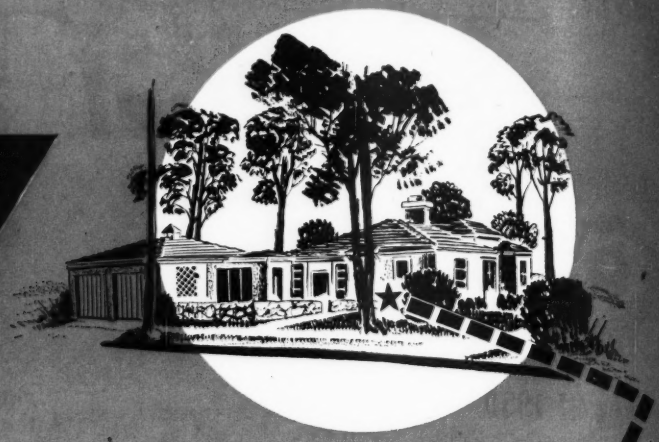
It therefore seems appropriate to bring up again the matter of plastic tubing for services and small mains. This type of material, fabricated principally from Tenite II (cellulose acetate butyrate), was used quite extensively in some gas distribution systems during the last war, and has also been employed for small water irrigation systems, lawn sprinkling, etc. At least to this writer's knowledge, these plastic installations have been satisfactory to date and the material appears to be inert to soil, water, and gas. Also installation is relatively easy and simple, and cost is not out of line.

One obvious advantage of plastic is its electrical resistance: it is not subject to electrolysis or soil corrosion, nor does it produce the galvanic corrosive effects encountered from dissimilar metals such as steel and copper—in fact, it actually serves as an electric insulator to break up the electrical continuity of the metal gas piping system (which is often desirable) or to electrically separate the gas system from the water system where they meet at the water heater. In addition to its use for services and small mains, in unsupported and direct contact with soil, one company at least is experimenting with smaller, thinner wall tubing for service renewals whereby the old metal service is left in place and the plastic tubing pulled through it.

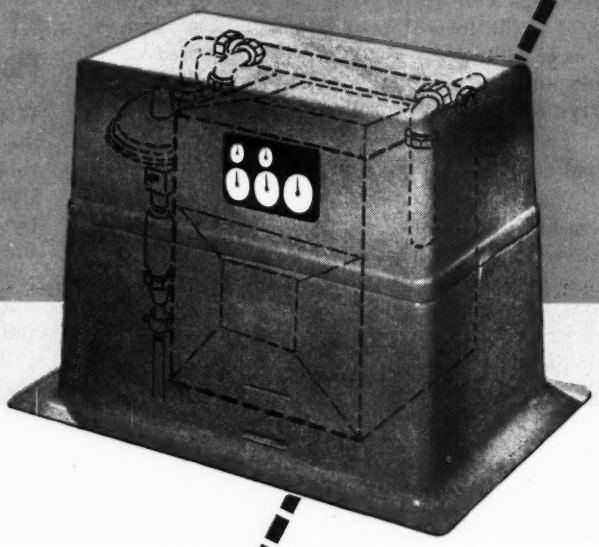
For the benefit of anyone who wishes to review the use of plastic material for gas distribution, and the technology of plastic formulae in general, a comprehensive article entitled "Plastic Tubing for Gas Service Piping" was published in the October 1946 issue of *GAS*, this Technical Trends page for October 1950 carried a brief discussion of the most promising types of plastic underground service, and the January 1951 issue of *Modern Plastics* reviewed the technical and economic status of all commercial types of plastic in considerable detail.

Zenaloy

RESIDENTIAL METER AND REGULATOR COVER



The Modern Meter Cover



PATENT PENDING

A sensational new protective and decorative cover for gas meter and regulator installations, made from glass fibers and polyester resins.

MATERIAL—

*Zenaloy** a reinforced plastic made from Fiberglas and polyester resin material.

STRENGTH—

Flexural Strength—approx. 25,000 psi.

Tensile Strength—approx. 18,000 psi.

Compressive Strength—approx. 20,000 psi.

The impact strength of this material is very high and will be approximately 15 ft-lbs/in. of width. The modulus of elasticity is approximately 1½ million.

WEIGHT—

1/5 the weight of steel. 25% lighter than aluminum.

1/10 the weight of concrete. Complete unit weighs 12 lbs.

GORDON Z. GREENE CO.

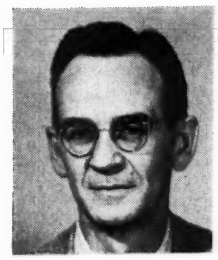
MANUFACTURERS OF OIL AND GAS SPECIALTIES

TUcker 1279

2335 EAST EIGHTH STREET, LOS ANGELES 21, CALIFORNIA

ZENALOY* is the trade name for the Reinforced Plastic Products manufactured by ZENITH PLASTICS CO.

DESIGNING A DISTRIBUTION SYSTEM TO ACCOMMODATE FUTURE EXPANSION



By HERBERT M. DWIGHT
Southern California Gas Co., Los Angeles

DESIGNING a gas distribution system in this complex age in which we are living is not the simple matter that it was when past experience was a reliable guide to the conditions that might be expected in the years ahead. The tremendous industrial development brought about by World War II and the subsequent boom in residential building resulted in demands for gas far in excess of the most optimistic estimates of a few years before, and distribution engineers had to discard many of the time-proven factors that had served them for many years.

Exclusive

High Pressure Only

To discuss the entire subject of distribution design in an article of this length would be quite impossible, and it would seem advisable, therefore, to limit the field to some of the more basic considerations that have been found necessary, or at least desirable, in the development of the modern gas distribution system. First of all, let us enumerate some of the elements which, at least in the author's opinion, do not belong in the picture as we see it today.

The first of these is the low pressure distribution system. In the days of gas lights and horse-drawn vehicles, the low pressure system had its place. The modest demands of the customers were easily met and if one had to turn off the side-arm water heater and forego the morning bath in order to have enough gas pressure to make the breakfast coffee—well, such was life in the "good old days" and the bath could wait until Saturday night. Similarly, industrial loads, as we know them now, were nonexistent, and the relatively inflexible low pressure system could, with an occasional boost from a trunk line or header, meet the peaks without too much pressure variation. Furthermore, the sources of gas (mostly manufactured) were capable of delivering their product only at very moderate pressures, and operating compressors to raise these pressures was an expensive process. With high pressure natural gas available in ever-increasing amounts and with "big inch" and "super inch" transmission lines rapidly finding their way to every part of our country, the low pressure system is on its way out. Hence, we shall confine most of our remarks to planning for distribution system expansion using high pressure design.

Another undesirable element, in our opinion, is the single-feed system, or what might well be termed "putting all of your eggs in one basket." Large diameter headers are necessary in many cases, even in high pressure systems, to provide adequate supplies during peak periods; but wherever possible, and particularly in large metropolitan areas, the multiple feed system with several trunk lines of intermediate diameter is to be desired because of the added insurance against complete outages and because of the greater ability to accommodate shifting and increasing loads.

Natural Gas Systems

Finally, as intimated above, this discussion will be limited to factors applicable to natural gas distribution systems. This does not mean, of course, that the general principles would not apply to manufactured gas systems as well, but the loads, consumption per customer, and similar factors are based on natural gas operations.

Distribution design consists of two

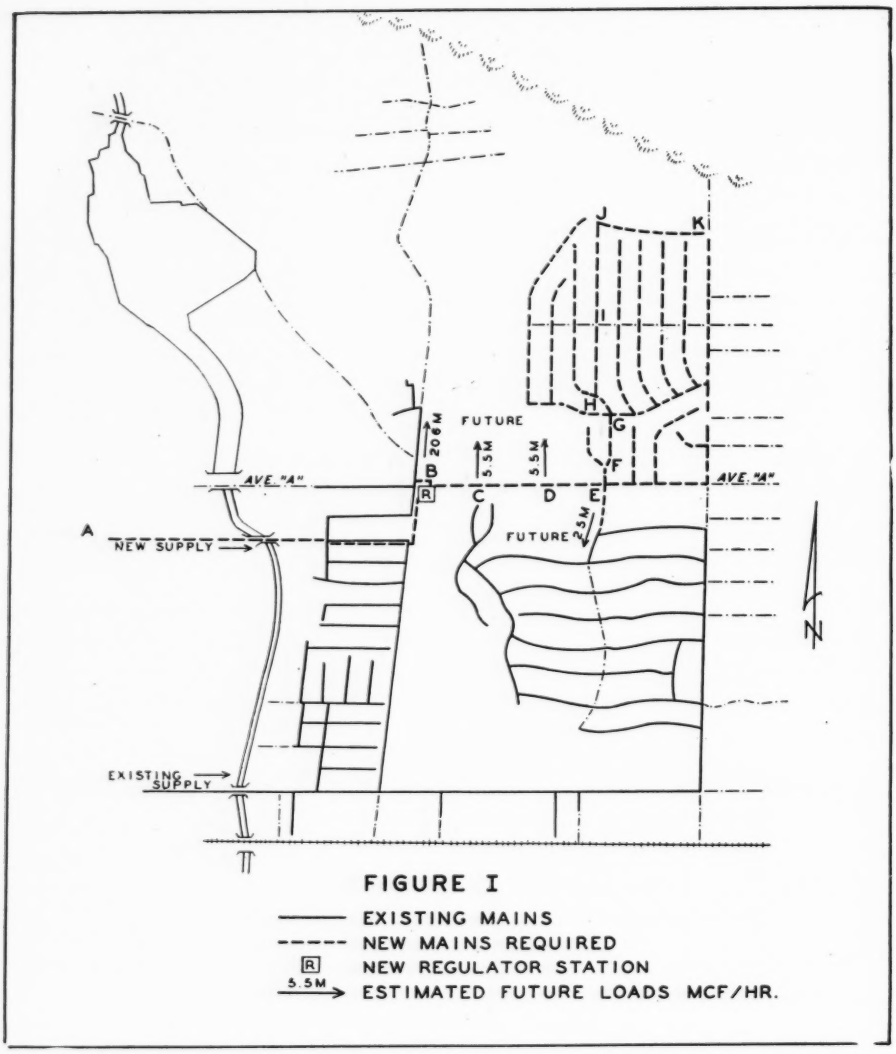


FIGURE I

general problems: (1) planning of new extensions to serve additional customers or previously undeveloped areas and (2) redesigning of the existing system to permit proper integration and sizing of mains as replacement becomes necessary because of conditions or inadequacy. The approaches to these problems are, of necessity, quite different. In the first case we are dealing largely with unknown factors so far as the ultimate load or potential development are concerned, and it is necessary for us to correlate the known conditions with other similar cases previously encountered in order to arrive at a logical and adequate design. In the second case we have the advantage of past experience in the particular area in question and frequently some indication as to whether there is a trend toward a different type of development than that for which the system was originally designed.

For example, some of the older single-family residential areas gradually develop into apartment house districts, new shopping centers spring up in outlying sections, and major slum clearance or low-cost housing projects are built in areas which formerly contained only moderate concentrations of small homes. If such trends are apparent or can be anticipated, it is possible to install, or at least make provision for, the facilities that ultimately will be required.

Forecasting

In any case, the first requirement in the design of a distribution system is the forecasting of design loads. In new systems which are expected to serve only residential or small commercial customers, this forecast sometimes can be made from the actual rated capacities of appliances to be installed. This has been true of much of the recent development in Los Angeles county, where a large percentage of the growth has been in subdivisions of from 20 to several hundred homes, each tract being built up completely by a single builder.

Since experience has shown that not all appliances will be in use at any given time, it is necessary, after determining the total connected load, to apply a correction factor to arrive at the coincident or design load for the entire tract. This can be accompanied by means of the following formula[1] which allows for diversity of use and which has been found to provide an adequate margin of safety:

$$D_L = \frac{Q_R}{\text{Log } (16+A)} \text{ in which}$$

D_L = Design load

Q_R = Rated connected load

A = Number of appliances producing Q_R

Small Metered Districts

If, on the other hand, the new extension is the result of individual building construction, it usually is necessary to estimate the design load from the load per consumer of another similar area, with consideration being given to the zoning and type of construction anticipated. Where available, small metered districts provide a reliable source of peak hour loads per customer, provided, of course, that the type of customer is similar to that in the new area to be served. If the necessary load information is not readily obtainable in this manner, other means must be utilized to arrive at the required estimate.

This was the case a few years ago in the Los Angeles area where the metered districts were too large and too diversified to provide reliable information as to the load per consumer except in a very general way. After considerable study it was decided to conduct a load survey which, since its completion, has proved invaluable not only for the forecasting of loads for new areas, but also in connection with operational problems and the redesigning of the existing system.

Mechanical Accounting

The area surveyed included approximately 685,000 meters and the rather detailed survey would have been almost too ambitious had it not been for the fact that we were able to take advantage of the mechanical accounting system in our billing department which automatically performed much of the work of combining and totaling the individual card records of consumption into convenient groups. Perhaps a brief description of the method used for conducting this survey would be of interest.

The month of January, 1949, was selected as typical of peak winter conditions and Jan. 4 was a day on which the sendout approached the potential maximum. Hence, the peak hour on Jan. 4 was selected as the basis for the determination of the maximum hourly load per customer. From district orifice meter readings, the peak hour sendout

[1] Vol. 22, page 485, PCGA *Proceedings* (1931).

on this date was determined and it was related to the total monthly sales for each meter reading cycle* during the month of January. This resulted in a "peak hour factor" for each cycle which coud be applied to the meter readings for any group of meters read during that cycle to determine the peak hour consumption for those particular meters. It was considered advisable to compute a separate peak hour factor for each cycle since the factors were found to vary as much as 30% during the month, depending upon the period included.

Consumption Per Customer

By means of the mechanical accounting system, the consumption for each customer was tabulated and the total was recorded for each block on each street surveyed. Meter reading dates for each block also were listed. The appropriate "peak hour factor," according to the meter reading cycle, was then applied to the monthly consumption for each block to obtain the peak hour load for that group of meters. This information, together with the number of meters in each block, was then posted to street maps of convenient size and scale for future reference.

As stated previously, this information has been most helpful in designing new extensions, in redesigning old systems, and in connection with day-to-day load problems. As a rough check on the accuracy of the load survey, a comparison was made of the calculated peak hour and the actual sendout for the same hour in certain metered districts within the area surveyed. Although considerable variation occurred in some of the districts, the overall accuracy was well within the desired limits.

Accurate estimates of future loads, to be used as a basis of system design for industrial districts, are extremely difficult because of the wide variation in gas requirements of various industrial processes. The locations of unusually large industrial gas consumers requiring several hundred Mcf per hour cannot be predicted, and it is not economically practical to install in advance distribution facilities designed to supply this type of load; however, where large trunk or transmission mains can be routed near favorable industrial sites, profitable large consumers may be attracted. Usually mains to supply the large industrial consumers are designed individually and extensions are made on the basis of the allowable investment justified by the expected return.

4-Inch Minimum

It is not intended to suggest that facilities be installed with capacity to supply only the industrial loads immediately in view. It is our general practice to install 4-in. mains as a minimum size in industrial areas where future development of small industrial plants is probable. With an initial district pressure of 50 lbs this provides sufficient capacity for industrial loads ordinarily encountered at moderate additional cost over that of 2- and 3-in. mains. It is advisable to limit delivery pressures to consumers to the lowest practical operating range in order to be able to take advantage of large pressure drops in the mains where heavy loads develop.

Another consideration in the design of a distribution system for domestic and commercial loads is the pressure range within which it is desirable to operate. This is a matter which is subject to considerable difference of opinion and there is little doubt that we will be challenged on any recommendations that we may offer in this connection. However, the standard adopted for our system has worked out quite satisfactorily in our case and the reasons for its selection are, we feel, quite sound.

Pressure Limits

A standard distribution pressure of 15 psi was selected with a maximum design pressure drop of 5 lbs in the mains and an additional 2 lbs in the services. In new areas, where ultimate loads cannot be forecast with a reasonable degree of accuracy, the pressure drop in the mains for the assumed design load is held to a smaller figure, sometimes as low as 2 lbs. This also is true in areas in which relatively large loads are expected and their locations cannot be accurately predicted, such as in a downtown business district.

These pressure limits assure adequate service under the design conditions, they permit the use of 2-in. diameter pipe for the greater part of the system, and they represent a conservative range from the standpoints of leakage, maintenance work, and emergency repairs. In case new loads develop in a given area which are somewhat in excess of those anticipated, they still can be handled either by a slight increase in initial pressure (which still would be within reasonable limits) or by permitting a greater pressure drop through the system provided it does not adversely affect other customers in the area.

Trunkline Pressures

Trunk lines are designed to operate at 60 psig initial pressure with a maximum drop of 25 lbs, thus leaving a 20-lb margin for pressure drop through district regulator and dust filter installations, unusual loads or emergencies.

Fig. 1 illustrates a typical problem encountered in the design of an addition to an existing distribution system in a residential area. The main installations required to supply the lots within the tract are indicated by the broken lines north of Avenue "A." The rated capacities of the appliances to be installed were obtained from the builder

*The meter reading cycle is the period from one meter reading date to the next.

FIGURE II

SAMPLE CALCULATIONS OF MAIN SIZE

SUPPLY OF NEW AREA _____ BY _____ DATE _____

CALCULATIONS BY POLYFLO RULE

STA.	LENGTH IN FT.	VOLUME IN MCFH	SIZE	$P_1^2 - P_2^2$	PRES.	PRES. DROP	SIZE	$P_1^2 - P_2^2$	PRES.	PRES. DROP	SIZE	$P_1^2 - P_2^2$	PRES.	PRES. DROP	SIZE	$P_1^2 - P_2^2$	PRES.	PRES. DROP	REMARKS
	TRUNK LINE				40#														
A						6.7													START OF NEW TRUNK LINE
B	5800	100.6	⑥	.69	33.3														PROPOSED REGULATOR
	MAIN EASTERLY ON AVE. "A"																		
B					15#														PROPOSED REGULATOR
C	900	80.0	⑥	.07			4"	.51											
D	900	74.5	⑥	.061			4"	.44											
E	1000	69.0	⑥	.06			4"	.43											
F	175	40.0	⑥	.0039															
G	702	38.9	⑥	.016															
H	377	9.2					4"	.004			③	.015							
I	940	5.3					4"	.0085			③	.0137							
J	1440	3.7					4"	.0027			③	.0105			2"	.073			
K	1465	.8									3"	.0007			②	.0046	10.5#		END OF TRACT

and the total design load for the tract was calculated as 44,000 cfh.

To determine whether this load could be supplied from the existing mains (shown in solid lines), pressure drop calculations were made carrying the new load, plus existing loads as obtained from the peak hour load survey, through the existing mains. It was apparent that existing mains could not supply the new load; furthermore, forecasts of future loads made on the basis of existing loads and available vacant building sites indicated that even the existing system would require reinforcement. It is difficult to install an "ideal square mile" distribution system when, as in this situation, loads must be forecast and future street locations are unknown. However, since the area is bounded on the north by a mountain range and on the east by definite franchise limits, it was possible at least to select a desirable district regulator location near the center of the future load and to plan a new trunkline into the area.

Selecting Main Sizes

The proposed main installations, shown by the broken lines, were then designed to supply the future as well as existing loads since the area has developed rapidly as a residential section. In this case the design was based on an initial pressure of 15 lbs and a fairly large design pressure drop of 4½ lbs was used since future development is limited in extent. *Fig. 2* is a sample of the calculation of part of the system and shows the form used which permits ready selection of main sizes after calculations have been made.

Fig. 3 illustrates the arrangement of gas distribution mains existing in a section of downtown Los Angeles in 1948. This section was typical of a considerable portion of the older business district where several earlier gas companies, often in competition with each other to reach prospective customers, had installed parallel systems, all operating at different pressures ranging from inches of water to 40 psig. Most of the old pipe in this system was in need of replacement and a redesign of the entire section was necessary to avoid the excessive cost of replacing the old duplicate facilities. During the summer of 1949 the old mains in this section were replaced and the newer mains were integrated into the one high pressure system.

Redesign

Fig. 4 is a diagram of the redesign of this section. The system was planned as a self-contained district within the area enclosed by three of the major freeways which are under construction or proposed.

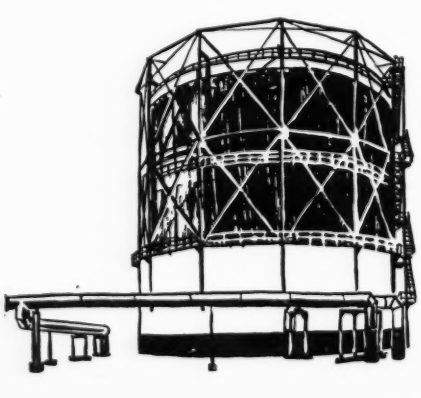
The existing loads in this section were determined from the peak hour load survey previously described and allowance was made for the trend, in the fringe areas, from residential to commercial and light industrial type of business. From these factors design loads were established which were expressed in terms of cubic feet per hour per foot of street frontage for each block or group of blocks, depending upon the amount of variation in estimated consumption.

Central Feeder

A central feeder loop of 8-in. diameter pipe was planned as the main supply for the area. This provides considerable flexibility in the system and allows sufficient capacity to handle fairly large industrial loads which may develop in the area. The number and size of district regulators supplying this district were related to the size of the header and the allowable pressure drop in the loop. The safety factor and flexibility requirements desired in the district could be met with a ½-lb pressure drop in the header. Maintaining pressures within these limits under normal conditions required three district regulators which were equally spaced around the perimeter of the loop as shown in *Fig. 4*. The balance of the mains were designed with an additional 1½-lb pressure drop, making a total drop in the mains of 2 lbs under design conditions. An additional drop of 2 psi was allowed in determining service size. Under ordinary load conditions, added insurance is provided by the multiple feeds into the 8-in. header, since the design pressure drop could safely be exceeded in an emergency such as the failure of a district regulator.

Although the design layout as shown in *Fig. 4* provides no ties not required for supply, the actual installations included a number of ties for pressure maintenance during construction or repair operations and for extensions of the header mains which are to be tied through to adjacent districts.

The foregoing example indicates what can be done in redesigning an out-dated system when complete rehabilitation is justified. However, the more common case is that in which gradual replacement of pipelines occurs as mains of various ages reach the point at which it is no longer economical to keep them in service. If all conditions affecting gas supply and demand in the area were static, it would be reasonable, perhaps, to replace these mains with pipe of the same size on the assumption that, since they had served the customers adequately in the past, they would continue to do so in the future. But how often do we find these fixed conditions in this rapidly changing world, particularly in areas in which the original gas distribution systems were installed 30, 40 or 50 years ago?



Overall Planning

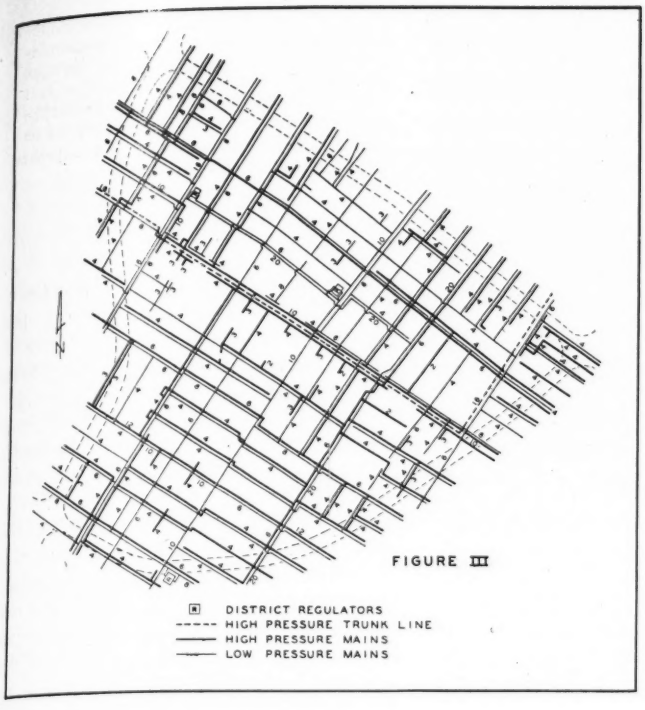
Certainly there has been nothing static about the southern California area during the past half-century and it was realized some years ago that overall system planning was the only answer to the problem of meeting the ever-changing load conditions. As a result of this conclusion, a master plan has been developed for the system which serves as a guide in sizing individual main replacements so that each one fits into the overall pattern.

The first step in laying out the master plan was the development of an ideal trunk line and district regulator system based on the best available forecast of loads by areas. Natural boundaries such as rivers, major highways, freeways, mountains and railroads were taken into consideration and district regulator locations were selected on the basis of one such station for each 100 to 150 Mcf/hr of peak load. Existing trunk lines were used as a guide in laying out the theoretical system since each new installation must, of course, be integrated into the existing system.

Checking Older Parts

Upon completion of the trunk line design, planning of the distribution system itself was undertaken, particularly in the older parts of the system where most of the replacements occur. Although this portion of the study is far from completed, the overall plan has been extremely helpful in recent years during which time hundreds of thousands of feet of main have been replaced and we are satisfied that it has resulted in a much more efficient system than would otherwise have been possible. It is important that the planning be kept up to date in light of new developments and changing load conditions, but this should present only minor problems once the basic layout has been established.

Another feature which has been made



a part of our routine planning is the sectionalizing of the distribution system in order to permit the isolation of relatively small areas in case of major disasters such as earthquakes, floods, or enemy air attacks. These "isolation districts," which average approximately 1½ square miles in area, can be isolated and shut down with a minimum of valve operations and without affecting the supply to adjacent districts. Maps and instructions for shutting down each of these districts are maintained in the hands of responsible operating personnel.

Augmenting Low Systems

As stated at the outset, the low pressure system, in the opinion of the author, has no place in modern distribution design, but many of us are faced with the fact that the extensive low pressure systems installed years ago represent investments that cannot be discarded overnight and, in many cases, the condition of the mains is such that they will serve for many years to come without excessive leakage or major maintenance expense to justify replacement with smaller diameter, high pressure lines. The problem for the present then becomes one of augmenting the supply to these low pressure systems as the loads increase.

In our case there is sufficient overlapping of low and high pressure systems in many areas to permit the installation of additional feeds into the low pressure mains from high pressure headers or trunk lines as they are required. In a few cases high pressure trunk lines have been extended for the immediate purpose of augmenting the supply to low pressure areas, but with the ultimate objective of supplying high pressure systems when conversion is warranted.

In the Pasadena area, difference in elevation has been one of the principal problems in low pressure operations. The elevation in the area served at low pressure varies from 700 ft to approximately 1700 ft above sea level. Since a rise of 200 ft causes an increase in gas pressure as compared to atmospheric pressure of approximately 1 in. w.c., it has been necessary to separate the system into two elevation increments of approximately 500 ft in order to serve all customers at pressures within a reasonable variation from our standard of 8-in. w.c.

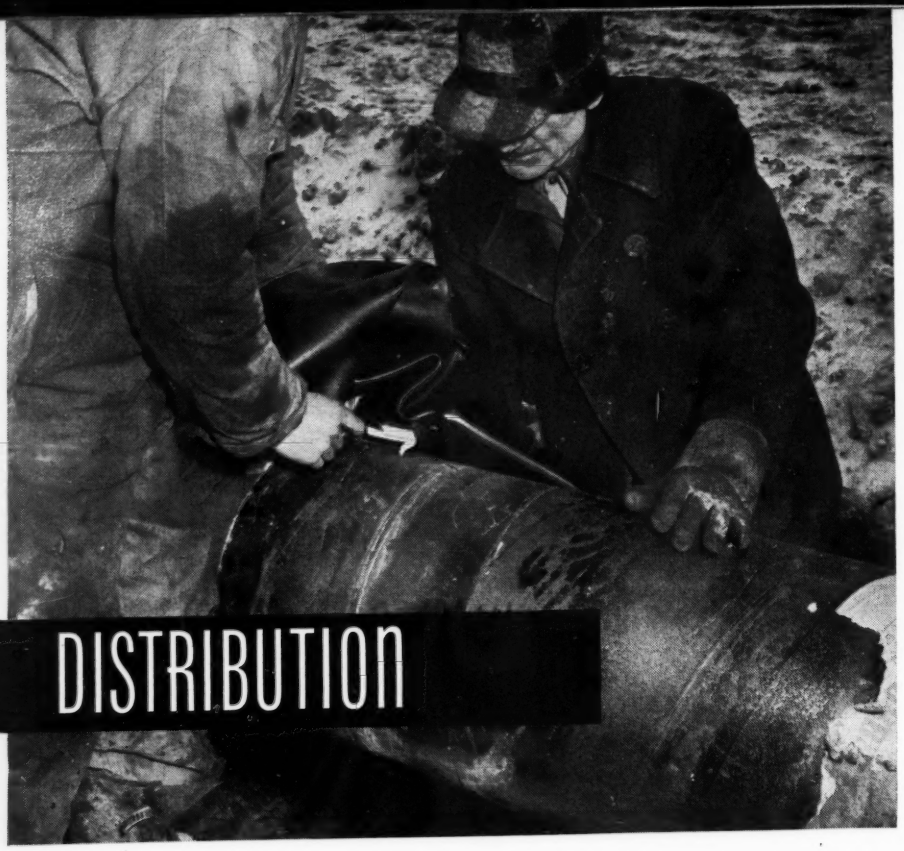
Converting Fringes

As opportunities present themselves, fringe areas are being converted to high pressure, and extensions of low pressure mains to serve new developments are avoided wherever possible. In many locations where replacement of low pressure main becomes necessary and a source of high pressure is available nearby, considerable saving in construction costs can be made by inserting smaller diameter pipe inside the existing main and connecting it to the high pressure supply. This is particularly true when the existing main lies under heavy pavement.

In concluding these rather general comments on distribution design, the author would like to call attention to one other principle that sometimes is overlooked in planning a new system or in rebuilding an old one. That is the simple fact that additional capacity in excess of that required for anticipated loads can be provided for only slight additional cost and often proves to be an excellent investment. Distribution system design is, at best, not an exact science and the error, if any, should be on the liberal side. Main construction costs vary widely in different areas and are affected materially by the amount of pavement involved, type of soil, other substructures, and a multitude of other factors, but in any case the added cost for larger diameter main always is less, in proportion, than the additional capacity gained as shown by the following comparison of typical new installations:

Pipe Size	Relative Cost	Relative Capacity
2"	1.0	1
3"	1.4	3
4"	1.8	6
6"	2.6	17
8"	3.2	37

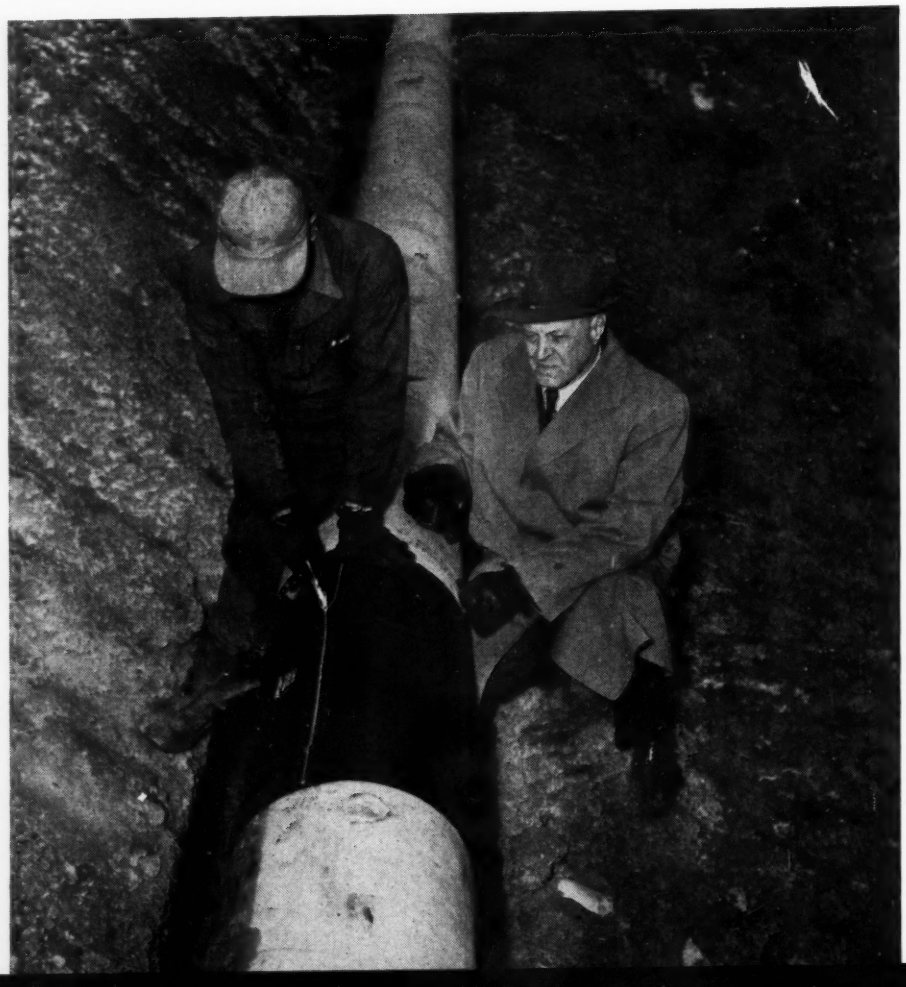
Not only does excess capacity in the distribution system provide desirable flexibility and permit handling of unusual peak loads and unexpected demand, but also creates a "cushion" which protects the customer in case of a line break or district regulator failure; and last, but not least, it furnishes insurance against the day when internal corrosion, dust accumulation, or other undesirable but inevitable occurrences result in pressure loss that is not provided for by the pipeline computer.



FIRST STEP is the removal of the protective tape from the pocket containing anaerobic microbiological corrosion inhibitor. This must be done so that the inhibitor will provide protection against any anaerobic bacteria which might germinate inside the Zipcoat and cause corrosion.

DISTRIBUTION

3500 ZIPCOATS SPEED LAYING OF INDIANAPOLIS UTILITY'S LINE



NEXT, D. S. Martin, Citizens Gas & Coke engineer, watches a workman zip the zipper.

FOR several years the Citizens Gas & Coke Utility of Indianapolis has been trying to bring the advantages of natural gas to its city. Last summer the Federal Power Commission granted approval for the construction of a 16-in. line from Zionsville station of the Panhandle Eastern Pipe Line Co., Zionsville, Ind., to the Citizens Gas system, making this objective possible. Once the necessary approval was received, the detailed planning for the job started and speed in every phase of the eventual work became a necessity in order to reduce the high cost of producing expensive water gas for the city's demands.

Exclusive

In planning the work, Chief Gas Engineer D. S. Martin, a man of 35 years' experience with Citizens Gas, came across literature describing a new device for protecting welded or coupled joints, "Zipcoats," manufactured by Dresser Manufacturing Division, Bradford, Pa., which seemed to offer considerable time-savings in the construction of the line. After investigation, this new method of joint protecting was selected on the basis of the speed and savings it offered. When the job was completed early in February approximately 3500 Zipcoats had been installed.

Synthetic Blanket

Zipcoats were first marketed by Dresser approximately two years ago after a long search by Paul F. Marx, corrosion engineer of the company, for a method of coating that would save time and also eliminate the hazards and mess of tar kettles. A Zipcoat consists of a blanket made of a synthetic material, 30 in. in length, with a slide fastener for closing the blanket over the pipe joint. They are manufactured either for welded or coupled joints and in 10-ft lengths for use with insulating joints. Possessing high dielectric strength, they are said to offer protection equal to or exceeding that of mill or yard-wrapped pipe.

Installation steps consist of, first,

spreading out the Zipcoat by the joint to be coated. A protective tape is then removed from a pocket containing an anaerobic microbiological corrosion inhibitor. Each Zipcoat contains such an inhibitor to give protection from any anaerobic bacteria which might germinate inside the Zipcoat. The second step is to wrap the Zipcoat around the pipe, centering it over the joint area with the zipper at the top. After the zipper is closed, the ends of the Zipcoat are folded back and a special cold sealing compound is brushed onto the pipe approximately 2 in. under the ends of the Zipcoat. The ends are then smoothed out on the pipe and the sealing compound is spread over all of the ends around the pipe. The final step is to apply the compound on the zipper so that it is entirely covered. After these steps, the trench may be backfilled around the joint in one-half to three-quarters of an hour.

Advantages of Zipcoats as found by Citizens Gas are their speed of installation and the fact that they require no cumbersome tar kettles or handling of hot tar along the line. In addition, there are no fumes which might be hazardous for workmen. Citizens Gas found that their men could install a Zipcoat in approximately five minutes under conditions of extreme cold. Backfilling was never delayed.

Construction Delays

Construction of the new line actually started on Dec. 14, 1950 and natural gas was turned on to the system on Feb. 3, 1951. Originally the contractor, Williams Bros., Tulsa, estimated that the job could be done in 30 days but Indianapolis suffered one of its worst winters in years. In addition, it was found that the soil in the area through which the line passed contained much water, and cave-ins along the trench were frequent. Pipe for the job was procured from National Tube at Lorain, Ohio, and it was coated by Hill Hubbell, also at Lorain. The pipe laid was 16-in. OD with 5/16-in. wall along the right-of-way. At river crossings ½-in. wall pipe, double wrapped, was used. Between Zionsville and Indianapolis it was necessary to make two river crossings and eight railroad crossings. At each of these, work was started well in advance of the time that the line itself reached these difficult points.

Cathodic protection, which includes seven insulating joints already installed, will be used to prevent corrosion of the new line.

IN PHOTO ABOVE, workman has folded back ends of Zipcoat and is applying with brush cold sealing compound 1 ½ to 2 in. under ends.

With the opening of the new line the City of Indianapolis will receive an additional 10 MMcf of gas per day, but it is expected that this will build up in volume as time passes. The natural gas received on the new line will be mixed with manufactured gas before distribution to the city. Water gas will still be manufactured to meet peak loads.

Citizens Gas & Coke serves a population of approximately 450,000 persons and has approximately 127,000 meters. There are 1300 miles of mains its its system. At present a new mixing station is under construction which will materially help the system's problems of expanded demand.

IN FINAL STEP, workman covers zipper and tape with cold sealing compound. Joint was ready to be backfilled in one-half to three-quarters hour.

SELECTING INSULATING FITTINGS FOR JUNCTURES OF COPPER TO STEEL IN MAINS AND SERVICES

By GORDON G. DYE
Southern California Gas Co., Los Angeles

THE problem of the mechanics of putting into effect a program of insulating copper-to-steel connections in soils with low electrical resistivities was facing Southern California Gas Co., Los Angeles, in early 1950. The insulation program was focused primarily on the problem of dissimilar metal corrosion, although similar insulating procedures are, of course, used to protect facilities from corrosion resulting from stray currents. The company had some 13 million ft of copper main and services connected in one way or another to steel and cast iron lines. The big multiplier, consequently, was in dissimilar metals connected directly, in corrosive soils.

The first step in putting an insulation program into effect then was to determine which specific installations would warrant insulation. The decision was to insulate in these three cases.

1. At the juncture of steel mains and copper mains.
2. At the service connection of a copper service on a steel or cast iron main; and at the connection of a steel service to a copper main.
3. At some point on the meter set assembly, to insulate both copper and steel services from the houseline.

Insulation was to be done in these cases wherever they existed in soils with a resistivity of 10,000 ohm-centimeters or less. By and large, there would be no reason to install copper in soils with greater resistivity; and in any event, corrosion would not be a serious problem in those few cases where copper and steel were connected in high resistivity soils.

An Exception

One exception was made to the general rule of insulating at the connection of a copper service to a steel or cast iron main. No insulation was considered necessary in the case of a service replacement where soft-drawn copper tubing is inserted in the casing provided by the old steel service. In such an installation, the tubing is bonded electrically to the casing and consequently the casing will normally be subject to corrosion before the main. Furthermore, there is less contact of the copper with the electrolyte constituted by corrosive soil.

The decision to insulate all meter set assemblies connected to both steel and copper services in corrosive soil areas was reached only after considerable discussion. Insulating steel services was warranted, of course, since so many water services are copper and a couple can easily be connected through the houseline. We finally decided that insulating copper services would be justified in terms of protecting any meters that might be touching the ground, protecting the customers' yard line, and insulating our facilities from stray current corrosion.

Our next step was to translate these general decisions into a specific program of fittings, materials and operating instructions. Our experiences with this part of the project are described below:

Copper Main - Steel Main

For several years, we have installed an insulating coupling at tie-in points between copper and steel mains. The coupling used was a bolt type in which the ends of the couplings are drawn together against a gasket seat, making a leak-proof joint at each end of the coupling. The insulation was provided by a rubber or neoprene sleeve-shaped gasket which slipped over the end of the copper. The insulation-sheathed copper is inserted into the body of the coupling, and the coupling tightened. This sleeve prevents electrical contact between the copper and steel pipe through the body of the coupling. Direct contact in the coupling is prevented by a lip in the insulating gasket, against which the tubing fits.

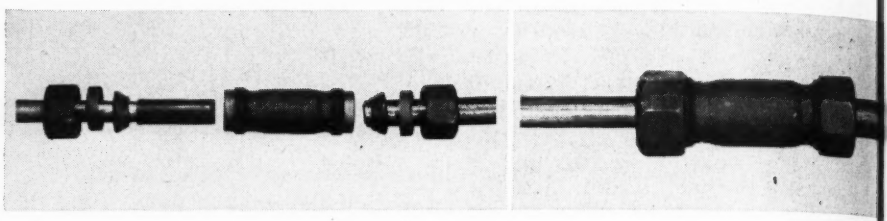


Fig. 1. Boltless line coupling for insulating steel from copper at the service connection. Exploded view is shown at the left.

Main-Service Connection

A smaller, boltless version of this coupling was used as our first means of insulating steel from copper at the service connection. A leak resistant joint is obtained in the coupling by means of a compression ring on each end. The compression rings, when tightened, firmly grip the pipe. In the case of a copper service connected to a steel service tee, a steel pup was welded into the outlet of the tee. The coupling was slipped over this short pup and the compression ring tightened. Then the insulating gasket was inserted over the end of the copper tubing, and the gasket (which also serves as an IPS-CTS adaptor) and tubing slipped into the other end. The compression ring on the copper end of the coupling is tightened to complete the assembly. This line coupling is shown in *Fig. 1*.

This type of coupling left two nonwelded joints as potential sources of leaks. And the pup welded to the tee

Presented at the Pacific Coast Gas Assn. Technical Services Conference, Los Angeles, March 7-8.

outlet was an extra item to carry in stock and account for. In view of these factors, and since some supply problems developed, we decided to get "two for one" by cutting the coupling in half. Each half coupling could be welded directly to the tee outlet. In addition to effectively doubling our supply, this also reduced the cost of each assembly by several cents, since the cost of the cutting and welding operations and the additional insulating adaptor gasket is less than the price of a complete coupling. This is the fitting which we are currently using to insulate copper services from steel mains. *Fig. 2* shows the half coupling after cutting, and after being welded to the tee outlet.

Insulating Tees

The next step in the development of this insulating device seems to be the elimination of the field welded joint at the tee outlet. Two manufacturers have presented for our consideration an insulating tee which has the insulating coupling and compression ring assembly forged or cast as an integral part of the service tee. Since such a tee would simplify field installation, we will probably standardize on it, if the price compares favorably with our "half-coupling" assembly and if its other features are suitable from the standpoint of our present field operating practices. One of the tees under investigation is shown in *Fig. 3*.

The full coupling will still be used in the relatively few cases where a steel service is to be insulated from a copper main. The full coupling can also be used to insulate an existing copper service by cutting out a short section of the service and installing the coupling with an insulating adaptor gasket at each end. And the full coupling will be used to insulate a hard-drawn copper service used to replace a steel service, where the existing service connection is re-used.

Incidentally, these fittings can be used to connect plastic services to steel main, several hundred of which are now being installed by the company on an experimental basis.

Insulation at Meter Set

Insulating the service from the houseline at the meter end presented more of a problem because of the variety of fittings which could be used and the number of places in the meter set assembly where the fittings could be installed. We set up certain standards which we felt should be met by an insulating device, as a means of screening the many possibilities.

1. The fitting should be leak-proof.
2. It should be reasonably strong, and maintain its strength through the range of temperature normally encountered in our area.
3. It should be, if not attractive, at least inconspicuous.
4. It should work equally well in both high- and low-pressure installations.
5. The fitting should require as few changes as possible in our present assembly specifications and installation procedure.
6. And, of course, it should have satisfactory insulating characteristics.

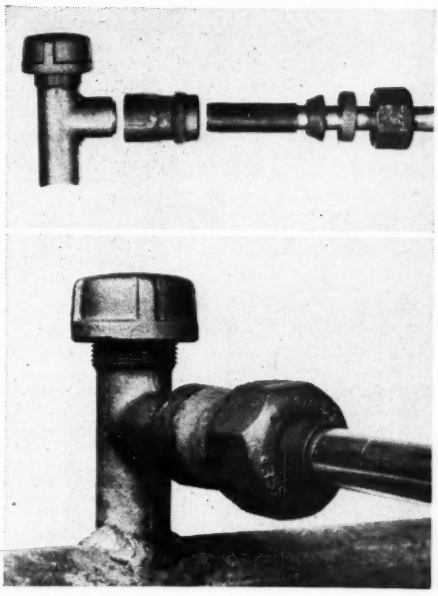


Fig. 2. Half coupling after cutting is shown above; after welding, below.

Many Tested

We inspected a number of fittings which met these requirements to varying degrees. The materials and designs of these fittings differed, of course. In essence, practically all consisted of a plastic insulating section which was pressed or threaded into a metal "carrier" fitting; or they were all-plastic fittings which could be threaded directly into a standard pipe fitting.

For example, we tested two types of insulating nipples which were designed to replace a standard ¾-in. steel nipple in the meter set assembly. One consisted of an all-plastic nipple; the other had a metal insert. Both could have been used satisfactorily with no changes in our present design or installation methods. Unfortunately, both types had a tendency to crack at the threads and the all-plastic version was not strong enough to withstand the bending moment which we felt it might have to withstand in service. In addition, the metal-insert model was quite expensive.

Swivels

The problems encountered with insulating couplings were quite similar to those presented by nipples. The strength of the all-plastic models was inadequate; the couplings which had adequate strength obtained by metal jackets were too expensive.

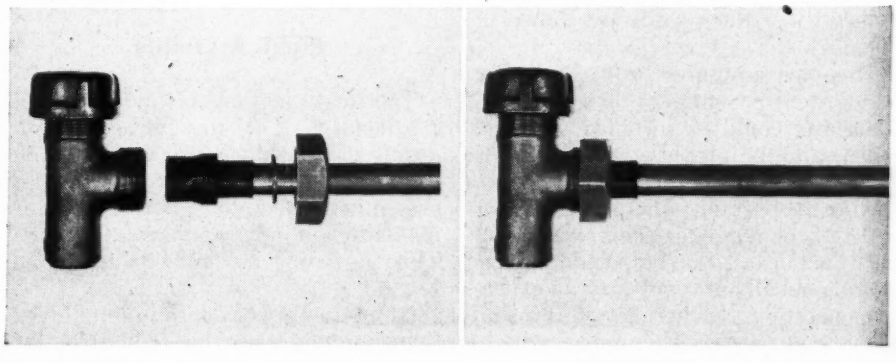
A number of insulating meter rings and meter swivels were also investigated. The insulation in these fittings was provided by a rubber or plastic insert which prevented metal-to-metal contact between the meter outlet or inlet connection and the meter swivel.

Disadvantages

It was decided not to use these because of the number of sizes which would have to be carried by field personnel; the fact that each insulating connection is made of three or four parts and thus would be troublesome to carry as units; and the fact that many of our sets are equipped with meter bars which would conduct current around the meter. A typical insulating meter swivel is shown in *Fig. 4*.

All in all, the insulator best suited to our needs which we have examined to date is a plastic bushing which can be threaded into a reducer or reducing ell. This is a simple, relatively inexpensive fitting, easy to install, which re-

Fig. 3. One of the tees under investigation. Shown at left is an exploded view.



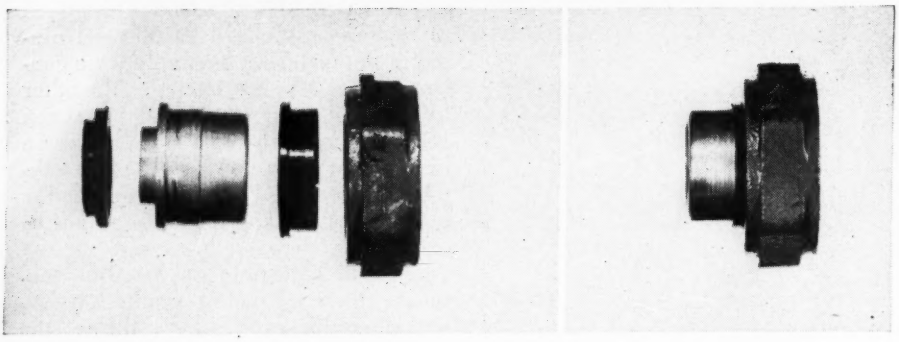


Fig. 4. Typical insulating meter swivel. Exploded view is at left; assembled at right.

quires only a minor change in our present standard meter set assembly. The strength of the plastic material is not so critical as it is, for example, in a plastic nipple since the complete body of the bushing is in compression between the female threads of the adapter and the male threads of the nipple.

Two Bushings

We have used bushings of two designs. One has a knurl or land raised on one end on which a wrench can be fitted. This land makes the bushing easy to install tightly; on the other hand, the samples of this type of bushing which we examined had thicker side walls, evidently for increased strength. This requires a reducer with a difference of two nominal pipe sizes, 1¼-in. x ¾-in. for example, which makes for a bulkier, less attractive assembly.

The other design is a straight or face bushing, with no wrench land. Less wall thickness is required and hence the assembly requires a reduction of only one nominal pipe size, 1-in. x ¾-in. for example. This makes a more compact, less conspicuous installation. The smaller reducer is also cheaper. We thought at first that some special inserting tool would be needed to install this bushing, but our field experience to date indicates otherwise. The bushing is threaded into the reducer as far as possible by hand; installing the nipple into the bushing sets it up tight enough to make a leakproof joint. This face bushing is our present standard. Both types of bushings installed in reducing ells are shown in *Fig. 5*.

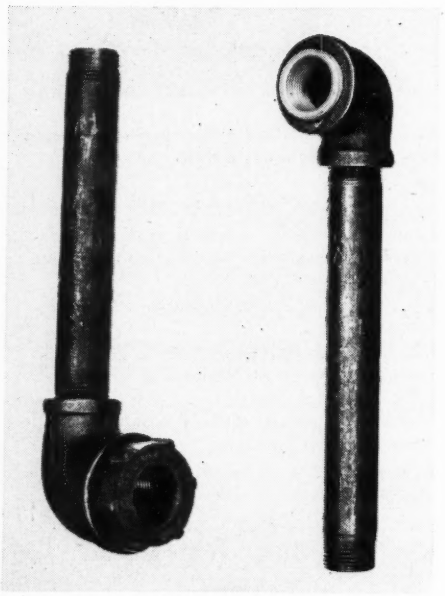


Fig. 5. Two types of bushings installed in reducing ells. One at left has a land raised on one end; at right is a straight or face bushing with no wrench land.

There are a number of places on our standard meter set assembly where such a bushing could be installed. It could conceivably be placed at any threaded connection. Consideration was given to placing the bushing either in the inlet or outlet of the regulator. This would simplify field installation but would require tapping out all our regulators, an expensive operation. Furthermore, this installation would be suitable only for high-pressure areas where regulators are used.

Another location which was considered was immediately above the shut-off valve or stopcock on the riser, in a line reducer. This would require a new type of fitting, however. Also, the installation conceivably could be shorted by water collecting on the upper surface of the reducer.

Final Assembly

The final decision, involving only a modification of existing fittings, was to install the bushing in a reducing ell which would replace the ell which is presently located above the stopcock or regulator on our standard assembly. This insulating assembly is shown in *Fig. 6*.

At first, some consideration was given to having this insulating reducer on the inlet side of the meter when attached to a copper service, on the outlet side when connected to a steel service. This would insulate the copper gas service from a meter which might be touching the ground. Since meters are normally 2- or 3-in. off the ground, we finally decided that this additional protection would be needed in too few cases to warrant the confusion which could result in the field. Besides, the meter could still be attacked as a result of a couple with a copper water service.

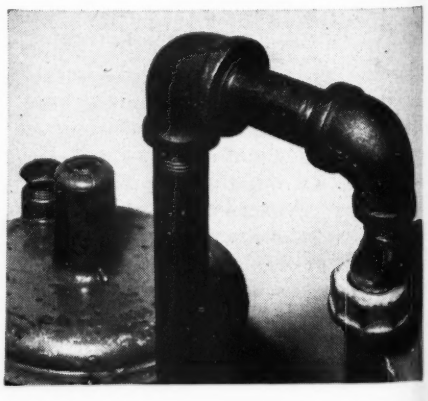
Present Status of Program

We are currently insulating all new copper services connected to steel and cast iron mains in corrosive soils, using the "half" coupling described above. The full coupling is used to insulate new steel services being connected to copper mains. In a few experimental tracts, we are going back to insulate copper-steel connections installed in the past. And all new copper and steel main connections are being insulated.

The meter set assembly phase of the program is just now getting under way. We have had some supply problems with the insulating bushings. As a result, our meter assembly insulation has been limited to tract operations in particularly corrosive soils, and to special experimental jobs. We believe the supply picture is improving enough to permit insulating at least all new meter set assembly installations in the near future.

We are still very much in the market for new, improved—and cheaper—insulating devices. The program is still new enough, particularly as regards meter assembly insulation, so that our work to date is in a sense largely experimental. We are still far enough from a complete insulation program that we can continue to experiment for some time.

Fig. 6. Final insulating assembly with bushing installed in a reducing ell, replacing the ell located above the stopcock or regulator.



HOW CATHODIC PROTECTION WAS APPLIED TO THE UNDERSIDE OF A WATER-SEAL HOLDER

By E. H. GREBSTAD
and T. H. GILBERT

LEAKAGE and severe pitting developed in the bottom plates of a 3-MMcf gas holder owned by the Southern California Gas Co., Los Angeles, because of corrosion of the underside of the plates. Since the practice of cathodically protecting the underside of large storage tanks is common and is reported by other companies to be successful, it was decided to investigate the feasibility of applying cathodic protection to the underside of this 177-ft diameter holder. Temporary cathodic protection and associated tests indicated that it would be possible to achieve the desired protection, so a system of distributed vertical graphite anodes was designed and installed.

Before proceeding with the installation of the cathodic protection system, it was necessary to test the soil in the area of the holder. This is a discussion of the soil properties and test procedures and results.

Test Data

The average resistivity of the 2- to 3-in. thick mixture of sand, oil, and water between the holder bottom and the concrete pad was 800-ohm-cm, the average resistivity of the concrete under this mixture was 7250 ohm-cm and the resistivity of the soil in the vicinity of the holder was 2300 ohm-cm.

The resistance of the holder bottom to earth was measured with a megger and also by using several values of drainage current and measuring the potential of the holder bottom to remote earth.

The measured values of this resistance were 0.84 ohm and 0.80 ohm, respectively.

Since the holder had been emptied and opened in order to make the necessary leak repairs, it was possible to enter the holder and obtain test data from inside while current drainage tests were made outside.

The potential of the holder bottom

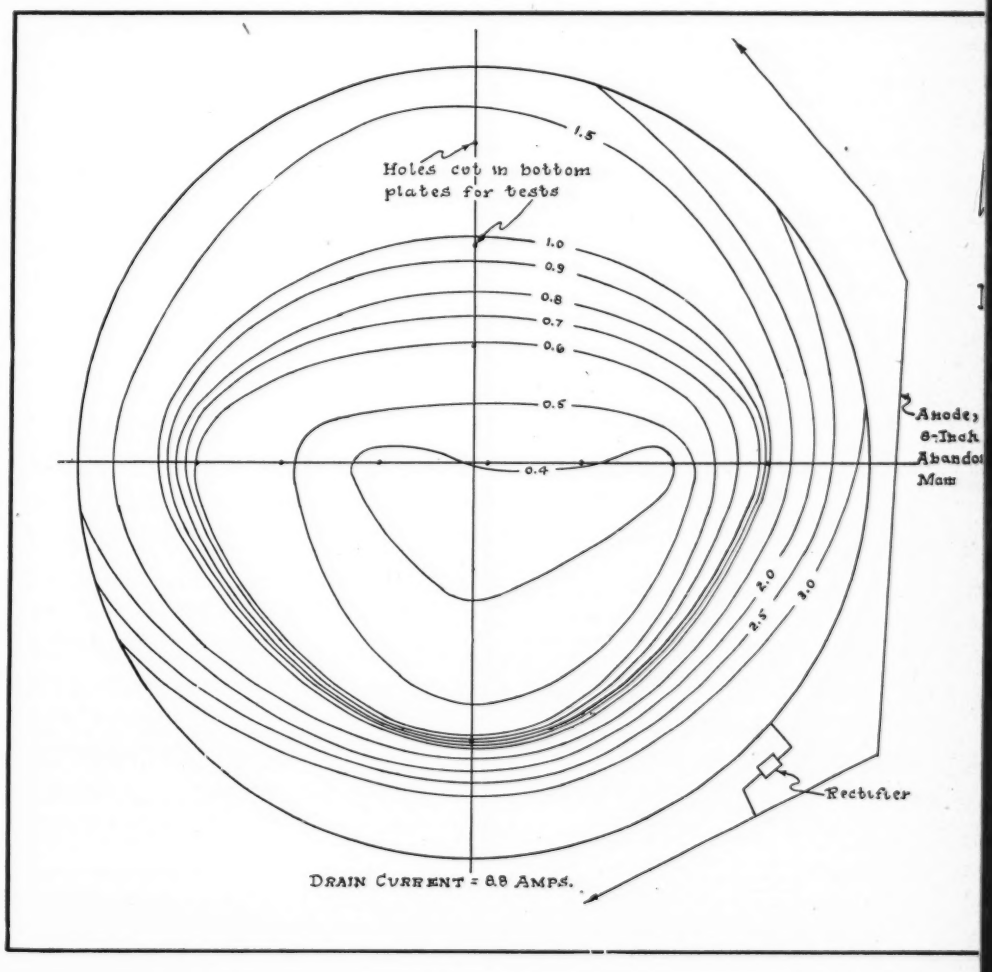


FIG. 1
EQUAL POTENTIAL LINES HOLDER BOTTOM

NOTE: The lines of equal potential represent the potential of the holder bottom with respect to a copper-copper sulfate electrode. The numerical values are negative volts.

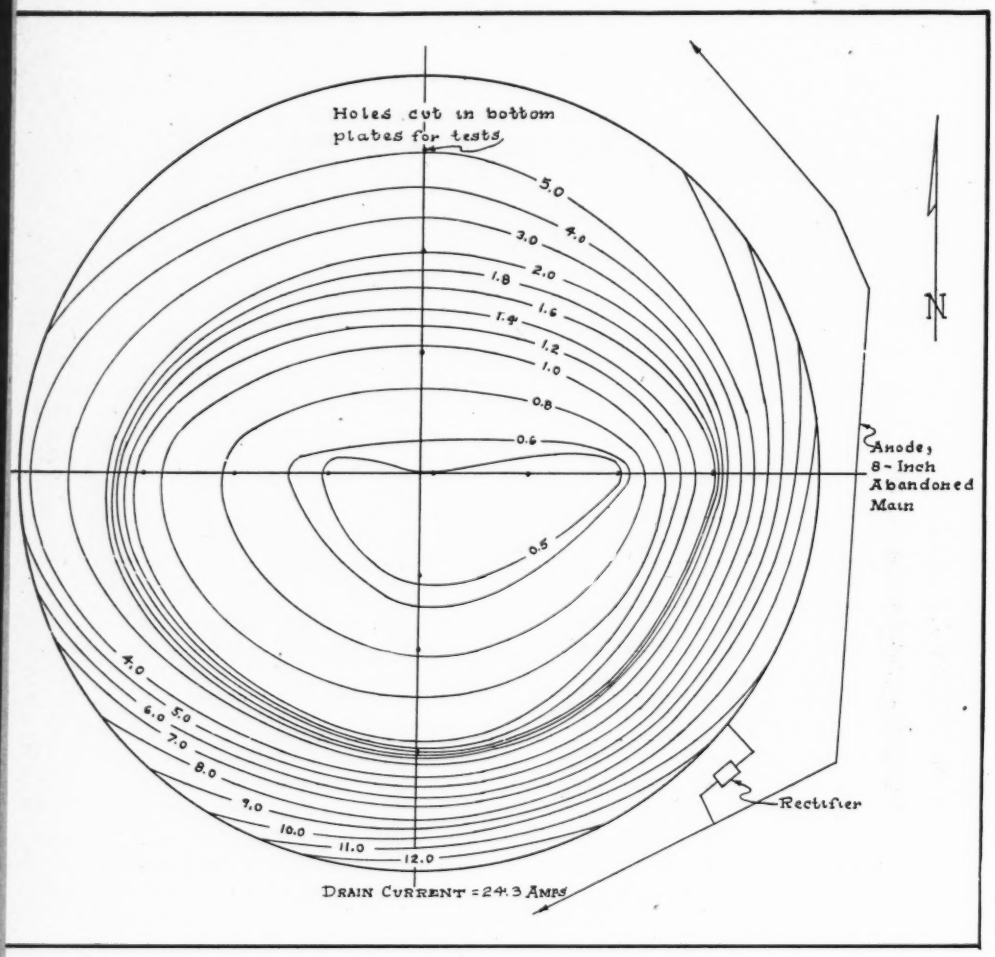


FIG. 2
EQUAL POTENTIAL LINES HOLDER BOTTOM

NOTE: The lines of equal potential represent the potential of the holder bottom with respect to a copper-copper sulfate electrode. The numerical values are negative volts.

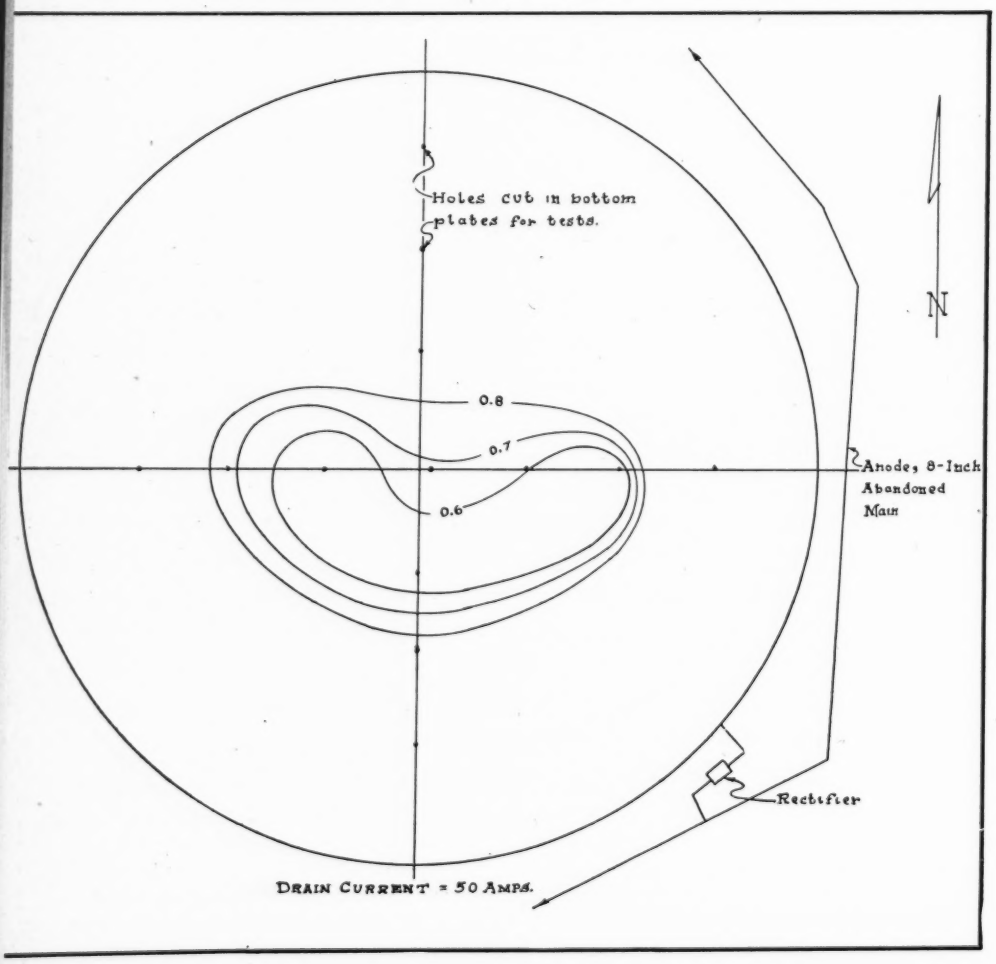


FIG. 3
EQUAL POTENTIAL LINES HOLDER BOTTOM

NOTE: The lines of equal potential represent the potential of the holder bottom with respect to a copper-copper sulfate electrode. The numerical values are negative volts.

was measured with respect to a copper-copper sulfate electrode at 13 locations in the holder bottom. One-inch diameter holes were cut for this purpose along two diameters of the bottom as shown in *Figs. 1* through *3*. These tests were made without drainage and while draining 8.8, 24.3, and 50 amperes. The holder was isolated from the yard piping during these tests by disconnecting all pipes from the holder. An 8-in. abandoned gas main which skirts the periphery of approximately one-half of the holder bottom was used as a temporary anode for the drainage tests, and the current was supplied by a 25-amp rectifier. Current for the 50-amp test was supplied by storage batteries.

Figs. 1, 2, and 3 show that most of the drainage current was picked up on the outer portion of the holder bottom and the current density was greater in the direction nearest the anode. As would be expected from experience gained with cathodic protection of bare pipelines, increasing the drainage current from 8.8 to 24.3 amps added considerably to the protection, but increasing from 24.3 to 50 amps resulted in very little additional protection to the center portion of the holder bottom using the abandoned main as an anode.

Anode Design

A system of distributed vertical graphite anodes was designed using coke breeze and National Carbon Co.'s "BF-2" backfill. The quality of coal coke is variable, especially that of coke breeze which sometimes is merely the sweepings of the storage area. For that

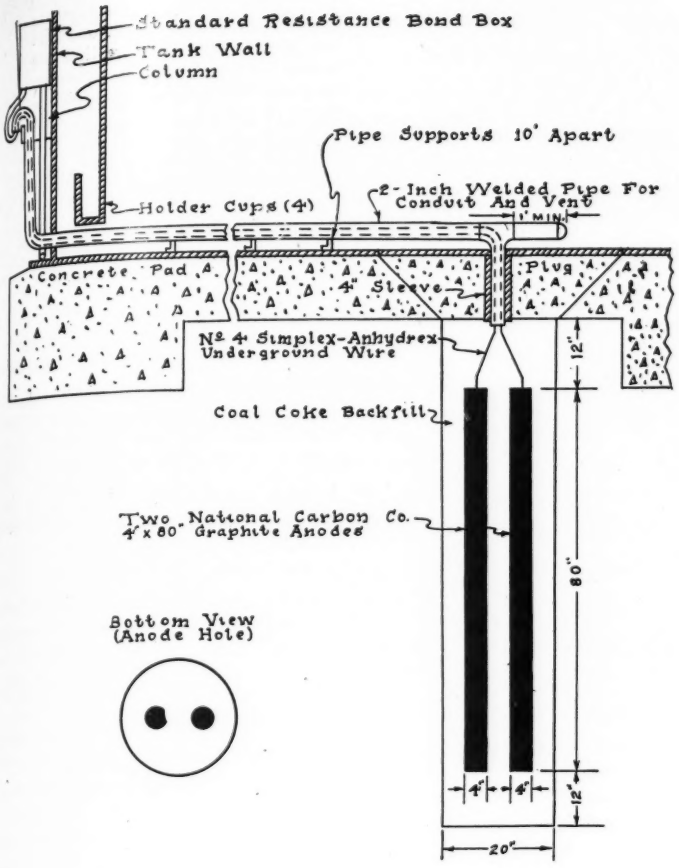


FIG. 5

DETAIL FOR INSTALLATION OF TWO CENTER ANODES AT THE HOLDER

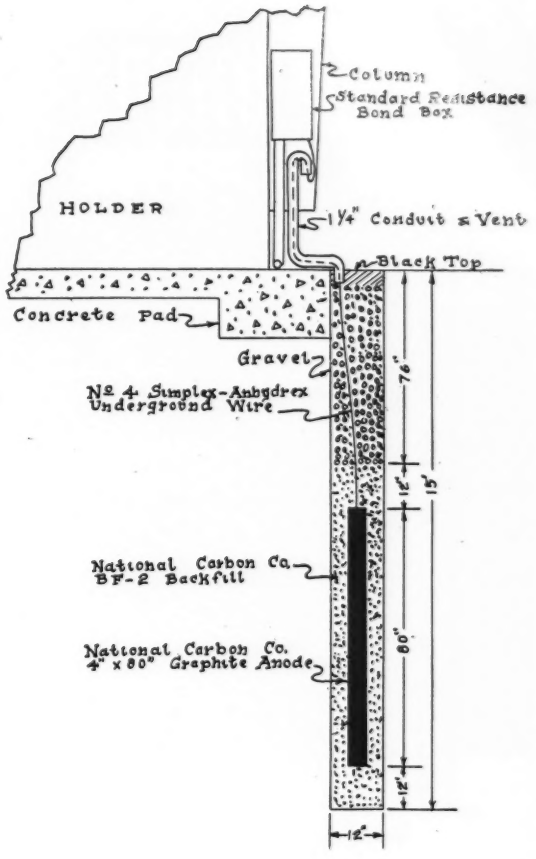


FIG. 6

DETAIL FOR INSTALLATION OF SIX GRAPHITE ANODES AROUND PERIPHERY OF HOLDER

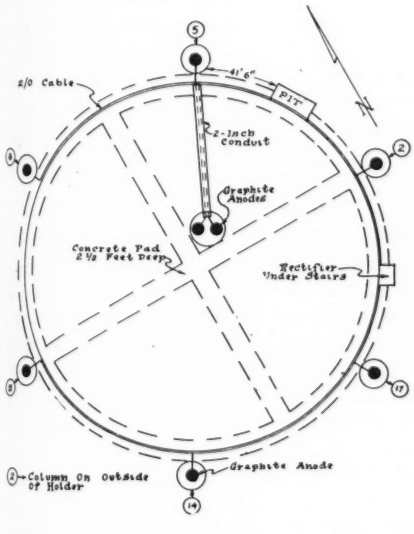


FIG. 4

LOCATION OF GRAPHITE ANODES INSTALLED AT HOLDER

reason it was decided to test a number of available coke breezes before using any one. This was done by measuring their resistivity and determining the amount of impurities they contained. The coke breeze selected for this installation had a resistivity of 6 to 36 ohm-cm, an average of 15.6% noncombustible matter, and a mesh size of particles from 4 to 16 was specified. The "BF-2" material had the lowest resistivity of any material tested (0.6 to 1.5 ohm-cm), but the difference between the resistivities of "BF-2" and the selected coke breeze may be considered negligible as compared to the difference between either material and the surrounding soil.

The distributed anode system was selected to minimize cathodic interference to the yard piping and for better current distribution, especially under the center portion of the holder bottom. It was decided to install one anode consisting of two graphite rods, each with a separate lead, under the approximate center of the holder bottom and six evenly spaced single graphite rod anodes around the periphery of the holder bottom as shown in *Fig. 4*.

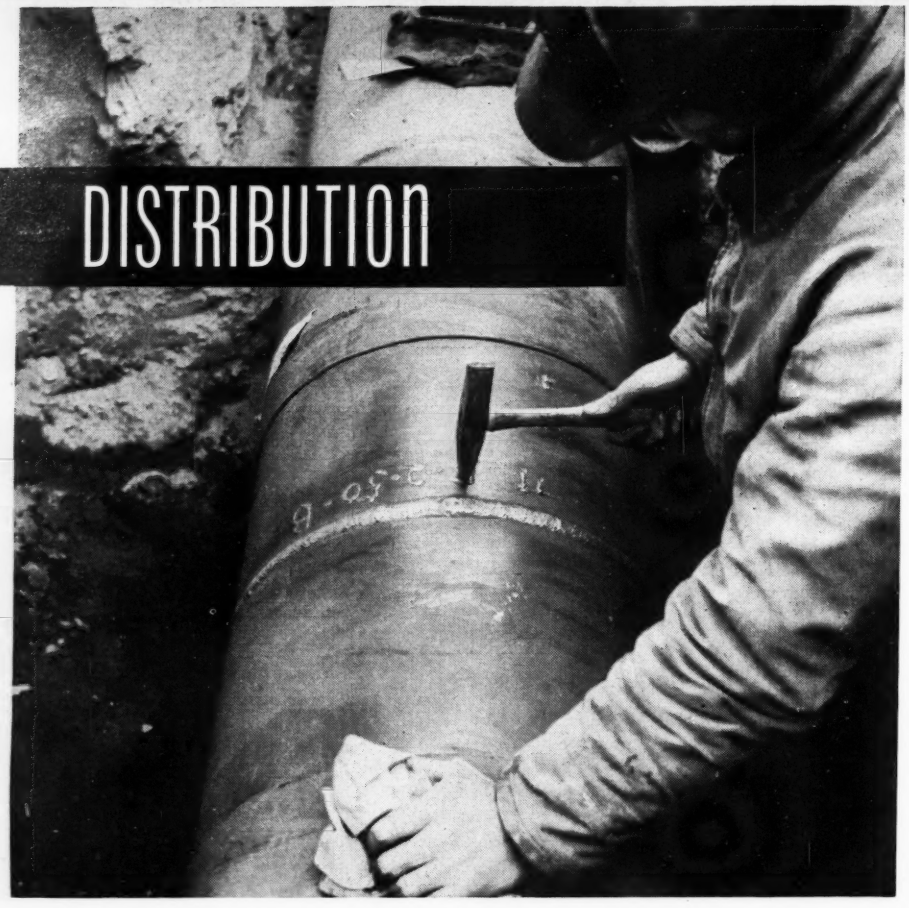
The details for installation of the anode under the center of the holder bottom are shown in *Fig. 5*. Due to the expense involved in replacing this anode if a failure should occur after the holder is in operation, two graphite rods with separate leads were installed in coke breeze backfill. The leads were brought through the holder bottom and out the side of the holder by a 2-in. water-tight pipe which will also serve as a vent for any escaping gases.

The details for installation of the outer graphite anodes are shown in *Fig. 6*. A pipe was installed at each anode as a conduit for the anode lead and also as a vent for any gases to escape since the anodes are under asphalt and gravel pavement.

The installation has just been completed and, as yet, final tests have not been made, but preliminary checks indicate that the protection will be very satisfactory.

Mr. Grebstad is electrolysis engineer, Mr. Gilbert technical assistant, Southern California Gas Co., Los Angeles.
This paper was presented at the Pacific Coast Gas Assn. Technical Services Conference in Los Angeles March 7-8.

DISTRIBUTION



IN PREPARING joint for application of tape, weld marks and pips are first removed. Here they are being worked over with a peening hammer to remove sharp points prior to taping.

APPLYING ELECTRICAL TAPE FOR WELDED JOINT PROTECTION AND PATCHING JOBS

By EDWARD S. SIEGEL

FOR many years corrosion engineers have been seeking a more suitable method for coating welded joints. The accepted methods of protecting these joints have been the "ragging" method, the use of poured forms, grease application, or any one of several other methods of hot application. Only recently have pressure-sensitive tapes been examined and adopted as an easier effective method of doing this work.

Exclusive

The tape that has been used to date is "Scotch" brand electrical tape No. 22, a tape with a special polyvinyl chloride backing and a Buna S type adhesive. It has been used in widths up to 6 in. It adheres immediately upon contact.

Fifteen years' experience with directly buried cables in a wide variety of soils has shown that polyvinyl chloride materials have excellent resistance to soil chemicals, and extensive laboratory tests have shown high resistance to acids, alkalis, bacteria, fungi and oils.

It was with that background in mind that tests of the tape were conducted by Ebasco Services Inc. in their search for a suitable coating material that could be readily applied in the field. Their tests, conducted in Texas, showed the material to be well suited to the work and to have outstanding properties for ease of application and for resistance to chemical action and to the effects of sunlight.

Ebasco's Texas tests were run in 250 ohm cm soil with No. 33 "Scotch" electrical tape (the same tape as No. 22, but 7 mils thick instead of 10 mils). Two of the specimens were operated continually for about one year at -102 volts to $CuSO_4$ electrode and the third specimen at approximately -.25 volts average $CuSO_4$ electrode (+ bus). The current in all cases was well below one micro-ampere per square foot with no tendency to increase. The resistance of the two negative specimens was 80,000 ohms per square foot and about half a megohm for the specimen connected to the positive bus. Negative specimens remained constant.

The material has been used by a number of leading utilities and industrial companies, including Brooklyn Union Gas Co., Consolidated Edison Co. of New York, Philadelphia Gas & Electric Co., and Shell Oil Co.

The cash saving, as compared to other methods, varies with conditions prevailing at individual jobs. In some instances, savings have been as much as 50% per completed joint, including cost of material and labor.

Taping is a fast method of coating, some two-man teams being able to wrap as many as four 24-in. joints per hour. It is a cold process. After weld slag is removed, the joint is cleaned with water or alcohol, and the tape is then spiral wrapped (usually half-lapped) over the entire joint, overlapping the shoulder of the original pipe coating. It adheres immediately upon contact, with no solvent activation and no heating. The joint is then covered with a shielding material for protection during backfill.

Similarly, breaks and defects observed in the enamel of coated pipes are patched with the No. 22 tape by washing and cleaning the pipe at the break and then covering with the tape, overlapping the edge of the break by about 3 in.

A third type of job for which the tape has begun to be used is the wrapping of service pipes against corrosion loss. In this use, the tape is half-lapped around the part of the service that passes through the basement wall and the part that is laid in the backfilled area adjacent to the wall. In addition, where it is necessary to lay the pipe in corrosive soil, its entire length is wrapped with the tape. Among the utilities using the tape in this manner is the Minneapolis (Minn.) Gas Co., which has encountered corrosive soils in about one-fourth of the area served by the distribution system.

The tape has also begun to be used as a wrapping to prevent corrosion on various types of installations above ground, because of its resistance to all types of weathering, including sunlight, rain, snow, salt spray, and temperature extremes.

Properties of the No. 22 tape listed by

Mr. Siegel is a field engineer, Minnesota Mining & Manufacturing Co., St. Paul.

A noteworthy example of the use of the tape on gas mains is furnished by the experience of the Brooklyn Union Gas Co., which saved approximately 50% of the cost of materials and labor by adopting the tape.

The installation involved 13 miles of pipe extending the full length of Brooklyn, from Newton Creek on the north. Four-inch wide tape (on 36-yard rolls) was used. The pipe varied in diameter from 10-in. to 24-in., with most of it 20- to 24-in. diameter.

The tape was first applied to the weld, then half-lapped to the right about 15 in. to cover the original insulation by 3 or 4 in.; then half-lapped back to the center and about 15 in. to the left; and finally back to the center—providing quadruple thickness of the tape over the entire joint. Rate of work was up to four joints per hour.

Company spokesmen have advised that the installation is expected to last "indefinitely" and that "the joints are the quickest, cleanest and neatest we have ever seen."

An additional advantage they pointed out was the enthusiastic reaction of the workmen to the tape. It was noted that the tape avoided the possibility of burns, and made the employees' work much cleaner and easier.

the manufacturer's laboratories include the following:

PHYSICAL PROPERTIES

Color	Black
Thickness, overall	.010"
Tensile strength	25 lbs/in.
Elongation at break	150%
Adhesion	20 oz./in.
Operating temp.	Up to 200°F
Application temp.	Best above 32°F

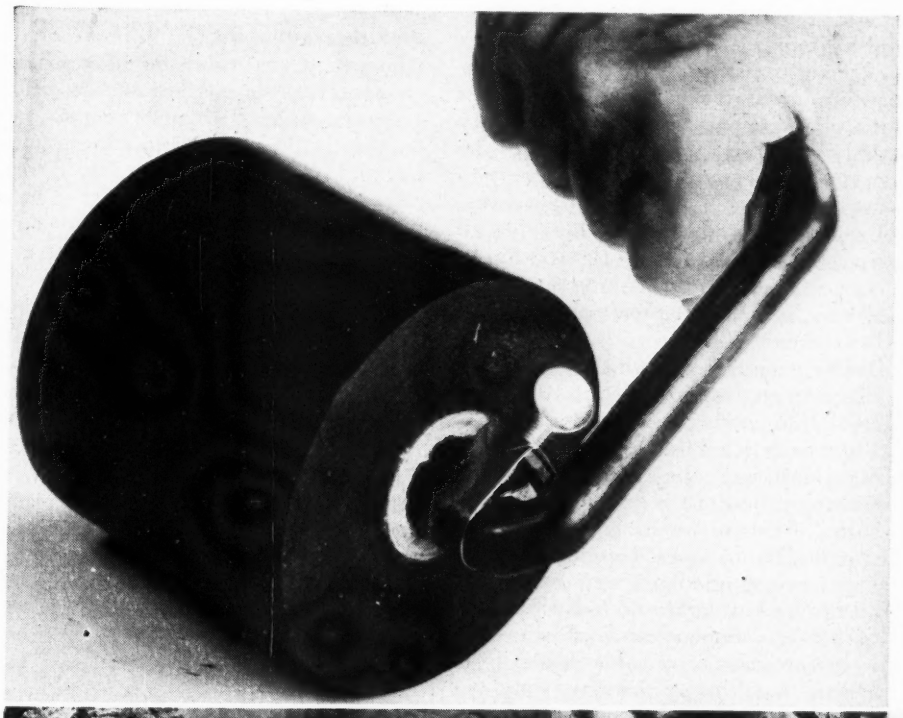
ELECTRICAL PROPERTIES

Dielectric strength	10,000 volts
Insulation resistance	100,000 megohms

GENERAL RESISTANCES

Sunlight	Excellent
Aging	Excellent
Water	Excellent
Salt water	Excellent
Alkalis	Excellent
Acids	Excellent
Alcohols	Good
Hydrocarbons, aliphatic	Fair
Hydrocarbons, aromatic	Poor
Oils	Good
Bacteria	Good
Fungi	Good
Plant acids	Excellent
Animal acids	Excellent

(The tape shows no tendency to rot or check after prolonged exposure underground.)



DISPENSER speeds up the job of wrapping the main. The model shown holds 36 yds of 4-in. wide tape. One roll per joint was used by Brooklyn Union.

LIGHT TENSION and a steady pull insure a tight, neat wrap, free of holidays. The tape is usually half-lapped.

HOW FOUR UTILITIES COOPERATE TO REDUCE LEAKAGE

By R. W. MILLER
Director, Utility Survey Commission

Exclusive

THE Utility Survey Commission of Pittsburgh was organized in July 1928 and has been functioning continuously since that time. The following four Pittsburgh public utilities contribute to its support on an equitable basis — Duquesne Light Co., The Manufacturers Light & Heat Co., Equitable Gas Co., and The Peoples Natural Gas Co. The headquarters of the commission are at the Mellon Institute of Industrial Research where the commission's secretary is on duty daily and where the outside men of the organization, numbering 19, report to the director each morning and evening. Facilities are maintained there for all necessary analytical work arising in connection with the commission's activities, and for the repairing of testing instruments.

Three natural gas utilities supply the Pittsburgh district—Manufacturers, Equitable, and Peoples. Metropolitan Pittsburgh covers a large area and, in many instances, the city proper is contiguous to various boroughs and townships, even surrounding one borough completely. In some sections of Pittsburgh proper and in the aforementioned adjoining boroughs and townships, two natural gas companies are offering service to the consuming public, whereas, in certain portions of the city, only one company is active. In other communities removed from Pittsburgh, but still in Allegheny county, generally speaking, only one utility sells natural gas.

The fundamental purpose motivating the organization of the Utility Survey Commission had to do with the elimination of natural gas leakage in the Pittsburgh district. Suck leakage, in addition to being hazardous to life and property, constitutes a goodly portion of the unaccounted-for gas loss which always commands the attention of gas company executives. However, as the work of the commission progressed following its organization, it became increasingly evident that attention should be paid to other situations which might be called incidental to the gas leakage detection program, and which may or may not develop in the streets and alleys of the city and suburbs, but which are of great importance from the standpoint of public safety. In the future, other avenues of investigation may become apparent, in which case the necessary additional work will be undertaken by the commission. At present, then, the commission is engaged in the following activities:

1. The inspection of all street openings in the entire district to discover indications of gas leakage.
2. The exact location of proper testing procedure of underground natural gas leakage so that necessary excavations and repairs can be made by the gas company or companies involved.
3. The investigation of carbon monoxide cases on the premises of the consumer, and the offering of remedial recommendations.
4. The periodic inspection of theaters, hospitals, churches, and schools to insure that there is no gas leakage from service lines, house lines, and appliances.
5. The investigation of gas odor complaints from the public.
6. Cooperation with city, borough, and township departments in investigating the presence of petroleum products and vapors therefrom in the sewer systems.
7. The location of underground gas lines.
8. Cooperation with the corrosion departments of various utilities.

The Utility Survey Commission has always drawn its working force from the four participating utilities. There are seven crews of men each under the direction of a crew leader who has had many years of experience in leak detection work. Some of the crew leaders have worked with the commission continuously since its inception.

Equipment

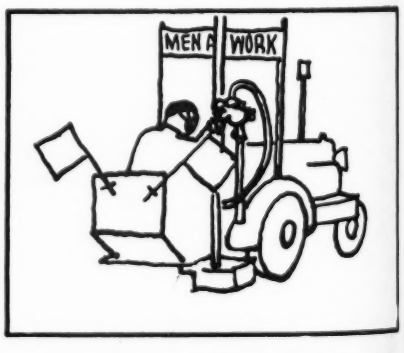
Each crew travels in a ½-ton panel truck, properly designated and equipped with all necessary testing equipment such as safety lamps, aspirators and rubber tubing, explosimeter, petroleum vapor tester, carbon monoxide detector, pipeline locator, Flamex apparatus, spudding bars of various sizes, sledges, bar puller, gas sample bottles, and soap buckets with brushes. Sand and cement are carried to fill bar holes. Each safety lamp, a modification of the old Davy lamp, is fitted with a telescopic base, to the lower half of which is soldered a ¾-in. nipple, 3 in. long, so that the lamp can be placed upright upon a manhole cover, the nipple extending downward through a hole therein.

To speed up testing operations, an aspirator with a proper length of rubber hose is usually attached by means of a one-holed rubber stopper to the aforementioned nipple so that the lamp can be held by the operator in a standing position and the sample being tested aspirated from its source. A battery equipped, motor-driven carbon monoxide testing machine is usually employed, although the aspirator-tube type has been investigated and is used at intervals. The pipeline locator is being used

General Procedure for Handling Leakage Evidence

When trouble is found, it is reported . . .

to the commission, which dispatches . . .



a crew to pinpoint the leak . . .

to an increasingly greater extent, engineering department drawings not always being infallible, and the memory of old time employees often in error.

Various makes of locators have been tried, and at least two found very effective. The Flamex apparatus, developed jointly by the first director of the commission and the present director in 1929, is employed to give rapid analyses on the job of samples taken in glass bottles by water displacement from manhole atmospheres found to be faulty. Results are expressed in percentages of natural gas found present. Such results are most valuable when bar testing operations are being conducted to discover the exact location of gas leakage. The additional equipment previously mentioned needs no comment.

Two of the seven crews are engaged continuously each day with general inspection work, testing all street openings on all streets, except when rain or snow is falling or when previously fallen snow makes such work impossible. The term "street openings" includes all manholes of all companies, storm and sanitary sewers, gate boxes of all utilities, all curb boxes, and vaults.

When natural gas is found in a curb box, the service line running from it is bar tested. A member of the inspection crew tests the atmosphere within the customer's home, and the cellar walls are checked for the presence of natural gas. If these tests reveal leakage, gas is cut off at the curb box and the nearest district office of the gas company rendering service is notified. During inclement weather, the two crews inspect schools, theaters, hospitals, and churches for outside and inside gas leakage, running 20-minute meter checks and, subsequently, locating any leakage should the meter have failed to hold.

The crews also instruct school custodians in the details of all such work so that they can conduct the tests each month on schedule, results being reported to the various central boards of education. One of the two crews operates within the confines of Pittsburgh, while the second devotes its attention to outlying suburbs in what is termed "non-competitive" territory, that being where only one gas company is rendering service. Each morning, the two crew leaders submit written reports to the director showing streets covered the previous day, numbers and types of street openings tested, locations of faulty conditions found, and percentages of natural gas involved where leakage has been detected. Suitable printed forms are used in part to minimize effort.

Prospecting for Leaks

The five remaining crews are assigned to definite areas, and to the leaders of those groups are given the reports of faulty conditions reported by the inspection crews, assignments being made each morning to the proper leader. His duty consists of finding the exact location of the leak or leaks, using prospecting methods—bar testing, using the safety lamp or explosimeter, analyzing samples from resulting barholes, and by reference to system maps already in his possession.

Competitive gas lines may be on opposite sides of the streets; in such an event, a final choice as to responsibility is much more easy to make than when the two lines are close to each other or, as is true in some cases, almost in the same original ditch. If the inspection crew has found natural gas in a curb box, the prospecting crews devote their time to testing on the main line or lines in the immediate vicinity, as well as over the service line from main to curb. As previously indicated, the service line from curb to meter has been checked by the inspection crew.

The five crews operating in the five different districts naturally do not spend all of their time in locating underground leakage; as a matter of fact, less and less time is so spent, as the general inspection crews find fewer leaks as time progresses. Weather permitting, the five crews carry on general inspection of all street openings in the streets of their districts. Their work is never in conflict with that done by the general inspection crews, all activities being carefully supervised by the director. If their inspection work indicates leakage, prospecting activities are commenced on the spot immediately.

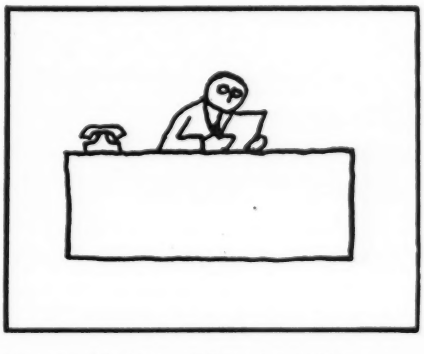
The five crews inspect public buildings in their districts during inclement weather or when time allows, covering all high schools in the area, for example, during the Christmas vacation period. They also busy themselves with carbon monoxide cases, with customer complaints of gas odors, with volatile hydrocarbons in sewers, and in locating underground pipelines. Frequently, if all is quiet within his own district, a crew leader with crew may assist another crew in another district where several faulty conditions may exist in one day.

Written reports are made each morning covering the previous day's activities by the five crew leaders. Small sketches are frequently prepared in duplicate, the originals of which are furnished to the gas offices of the district in which prospecting work has been done and locations selected for excavations.

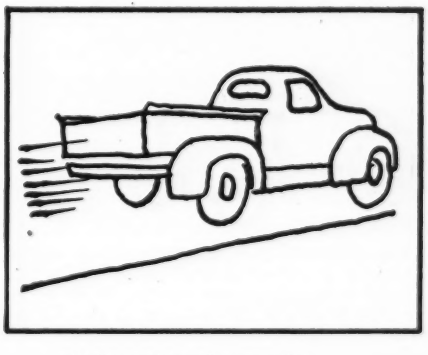
The seven daily reports are edited by the director and passed along to the commission's secretary, who assembles them in proper order for typing. Typed reports, when completed, are delivered by messenger soon after noontime to the executives of the participating companies. The secretary also keeps an accurate card system, one card for each street, showing all streets tested, number of street openings involved, faulty conditions found, and dates of test. A record of testing is kept for public buildings, showing dates of test and results.

Each quarter, an analytical report is prepared by the secretary showing totals of street openings covered, broken down as between types, companies, and municipalities. The secretary also receives telephone calls during the noon hour from the crew leaders to whom are given any complaints received during the morning. A similar procedure is followed at 4 p.m. when the director meets with the crew leaders and passes on for immediate coverage any complaints called in during the afternoon. By the use of such a system, all complaints are handled expeditiously. Some overtime night work is obviously necessary, but

The exact location is reported...



the commission notifies the utility...



which makes the repairs...

that is considered essential to the public's interest.

At intervals of three months, on a Sunday, the seven crews inspect all street openings in the "Golden Triangle," Pittsburgh's business district between the Allegheny and Monongahela rivers, and in the business district of what was once called the City of Allegheny, that being north of the Allegheny river. For years, prior to annexation, it was a separate municipality. Sunday is chosen because then traffic conditions are the lightest and automobiles and trucks are not parked over street boxes and manhole covers.

The entire area covered in the test work is divided into seven districts in such a manner as to avoid unnecessary traveling, giving each crew approximately 1200 street openings. The results of the quarterly inspections are incorporated in a special report furnished to the various company officials on the following day. Of course, if any serious leakage is discovered in the business districts by the testing crews, the location is given immediately to the director, who telephones the superintendent of the utility involved so that repair work can be started and finished, in many cases, before Monday morning.

The street openings in the so-called business sections of the smaller districts within Pittsburgh, such as East Liberty, Oakland, Southside, and Lawrenceville, to mention a few, are checked each three months by the crews operating therein. A similar procedure is employed by the general inspection crew so that all main streets carrying heavy traffic loads are adequately covered. Districts wherein blasting operations are under way have special attention, daily street tests even being run in some cases—currently, for example, as deep foundation work is under way downtown in connection with the erection of certain new skyscrapers in Pittsburgh's present expansion program.

Because of its topography, some earth slippages occur in the Pittsburgh district which demand attention, so far as gas lines are concerned. Knowing in advance from the proper city authority when streets are to be repaired, the Utility Survey Commission can have all street openings tested previously and, if necessary, the gas companies will have completed repairs or even laid new and usually larger main lines prior to the beginning of actual paving. Frequently, when large earth moving operations are under way, heavily loaded trucks are used over a definite route to transfer dirt to a site for filling. Those streets are tested each week, frequently at the request of property owners or of neighborhood associations.

All the crews, when testing street openings, are alert for curb boxes in need of repair and for what are termed "missing" curb boxes. High or low curb boxes, damaged boxes, those without lids or having broken lids, and the ones without screws should have attention for many reasons. Each day, if such conditions are found, mention of them is included in the daily report marked for the proper gas company's attention.

Every curb box lid should have a small hole in it which will expedite the aspiration of its atmosphere for testing. Lids without such holes are replaced with others properly drilled. Missing curb boxes pose a problem as, obviously, the inspection crews cannot spend too much time in location efforts. Usually, missing boxes are most often apparent in the newer residential districts where homes have been erected recently and when grading and seeding operations have covered the boxes. All such missing curb boxes are reported by the inspectors so that company crews can subsequently locate them.

Under-sidewalk vault inspections are made at intervals, usually during the winter when two men previously trained in such work are taken from their crews and assigned to the downtown area, as well as to smaller outlying business sections where vaults exist. Particular attention is paid by those men in each instance to the service line where it enters the vault, to the condition of the service line itself in the vault, where it enters the cellar, and to the meter with its fittings which are soap tesed. Explosimeter tests are made within the vault proper and along the cellar wall. Absence of sealing material around the service line is noted and reported for subsequent correction.

Pioneer Work

The work done by the Utility Survey Commission as described herein was of a pioneering nature in the beginning, and the same can be said of certain of its activities over the ensuing yars. It is a source of gratification to know that other gas companies in various cities are now engaged in similar programs, using some methods as developed in Pittsburgh or adapting them to their peculiar problems.

Benefits derived from the activities of the commission are both tangible and intangible. With some satisfaction it can be pointed out, for example, that to date, 2,116,862 street openings have been inspected, but that figure fails to describe completely what has been accomplished. Cold figures show a material drop in unaccounted-for gas losses of the gas companies involved as a result of continuing commission efforts to locate natural gas leakage. No one can hazard a guess as to the number of lives saved and the amount of property damage prevented because of those same efforts. It is a known fact that the entire program has been well received by public officials and by residents of the Pittsburgh area. They have come to depend upon the commission. Cooperation between the four participating utilities has been marked, a mutuality of respect now existing between them regarding their numerous problems. Certainly, because of the commission, public safety has been promoted, consumer relationships have been strengthened, and community confidence enhanced.

GROUND CLAMPS for the protection of gas line workers and property from dangers created by electric sparking have been devised in the Washington, Pa., machine shop of the Manufacturers Light & Heat Co. by Shop Foreman Walter M. Marshall. Of flat steel, the two clamps and appurtenant cable weigh only 19 lb. The clamps, made for pipe from 2- to 10-in. sizes, are 21 in. high and 11 in. wide. The standard cable is 10 ft. long, and waterproof. If desired, the clamp pattern can be enlarged, and the cable can be increased to any practical length.

PROBLEM: *find the regulator station*

Camouflaged Stations Keep Denverites Happy

By ROBERT H. TAYLOR
and
A. M. CHRISTENSEN

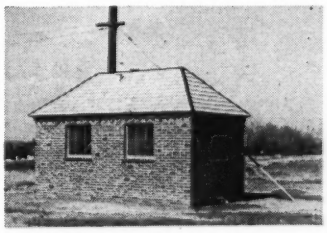
THE problem of obtaining suitable locations for the construction of aboveground gas pressure regulating stations in residential areas is a difficult one to solve. While home owners in the area usually will agree that an adequate gas supply is desirable, few will agree to a station location on or adjacent to their property. All want plenty of gas at all times, but rare indeed is the home owner who will willingly provide a station site for this purpose. This problem has been a constantly recurring one with Public Service Co. of Colorado during the past 22 years. How it has been solved in a satisfactory manner in nearly all cases makes an interesting story.

Exclusive

Natural gas reached Denver in 1928. Prior to that time manufactured gas operations had been carried on in the conventional manner, with a holder at the gas works and five district holders each equipped with pressure boosters. The distribution method in use at that time, and still in use today, employed individual service regulators and a preponderance of 2-in. main. Station outlet pressures were varied with load change to maintain about 10 in. w.c. at system extremities.

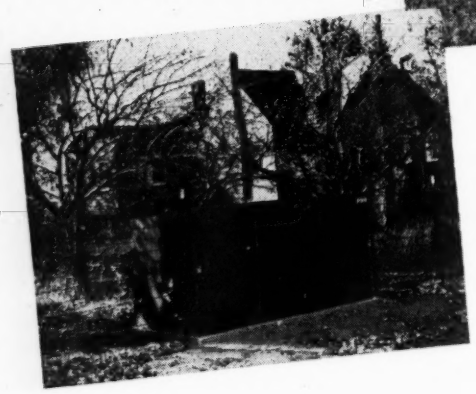
In the spring of 1928, an intermediate pressure system—some 11 miles of 20-in. and smaller size main—was completed, providing 40-psi gas to the gas works station and three of the five district holder stations. One pressure regulating station was constructed at the same time so a residential area, too large for conversion to natural gas as a single unit, could be divided into two sections. Thus when natural gas was turned on in late June of that year, it was supplied to the low-pressure distribution system of Denver through five regulator stations.

Mr. Taylor and Mr. Christensen are, respectively, superintendent of gas distribution and superintendent of gas pressure regulation, Public Service Co. of Colorado, Denver.



Hidden in the trim residence at top of page (Fig. 1) is an aboveground regulator station. Immediately above (Fig. 2), the same station is shown as it appeared before it was concealed. The station building is incorporated in the home at the extreme right end; between it and the living quarters is the garage.

In the Denver residential area, 27 such stations have been camouflaged through Public Service Co. of Colorado's ingenious methods.



FIGS. 3, 4, and 5 illustrate small capacity station units housed in wood or metal boxes located for convenient servicing. Units of this type are used for temporary area reinforcement pending the construction of a permanent station or upon first entering a residential area where the load magnitude and system growth are undetermined. Below (Fig. 5) is a larger box type station capable of supplying several hundred customers.

FIGS. 6 and 7. Below is a combination station and garage in the process of construction. Below, right (Fig. 7), construction is completed with the station neatly housed in one end of the family garage. The wall partition separating the station from the garage is on the company-owned tract. Demolition of the garage would leave the station unit intact. The station interior is faced with salt glaze brick to facilitate cleaning.

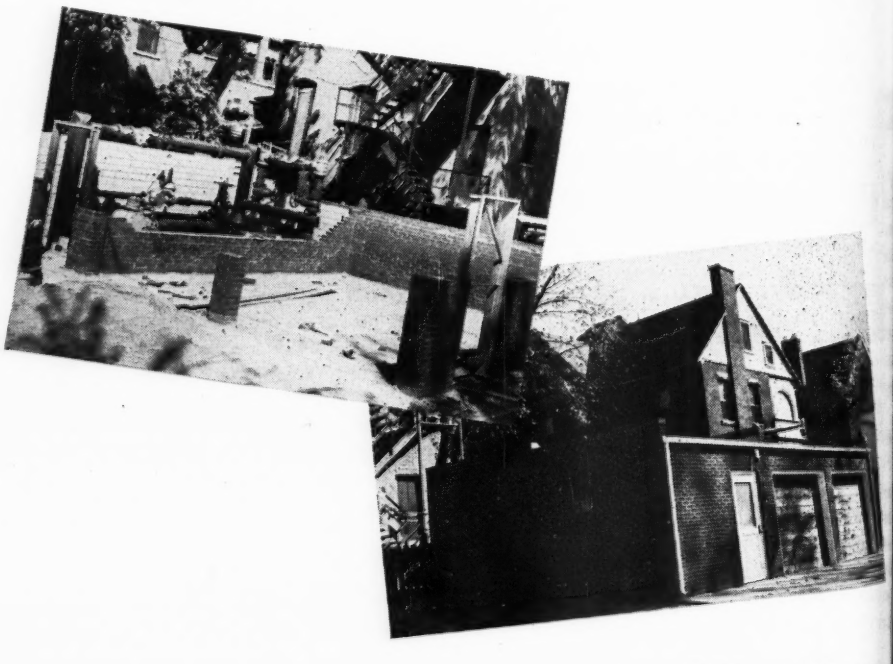
In 22 years, the Denver area has expanded from 65,800 to 108,500 total domestic customers, househeating customers have increased from 765 to 89,000 with a saturation advance from 1.2% to 82%, the peak day has grown from 9.4 MMcf to 186.8 MMcf, and regulating stations—numbering five in 1928—now total 133, with 41 within the corporate limits of the city and county of Denver, 92 in adjoining areas in which gas service has been introduced since 1928. Of the regulating stations now in use in the city proper, 28 are in residential areas. All of the Denver stations but one, a small constant delivery pressure station of a semi-temporary nature, supplying about a dozen customers in a sparsely populated commercial section along the southern city limits, are aboveground.

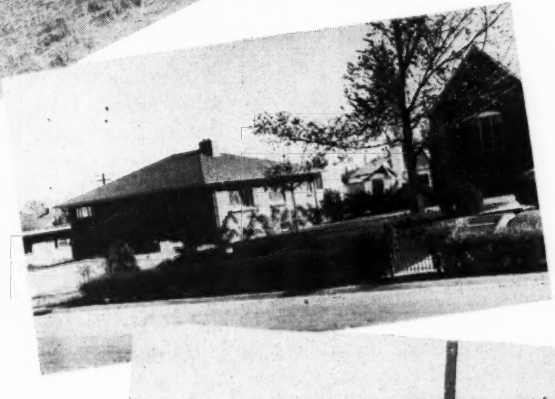
Several types of regulating stations are used in residential areas. A small capacity unit, housed in a wood or metal box and located in the front parking of a residential plot or pole-mounted in a street or alley, is frequently used when first entering a residential area, before the load magnitude and direction of system growth can be accurately determined. Units of this type are also used for temporary area reinforcement purposes, to postpone for a year or longer expensive main reinforcement or construction of a permanent station. *Figs. 3 and 4* illustrate stations of this type.

Fig. 5 illustrates a larger box type station, capable of supplying several hundred customers. This station is placed on private property, so located that all work on regulating equipment can be done from the public highway. Ground is obtained on a short term lease at a nominal rental. The station can be removed at small cost when the district requires a larger, permanent station.

In several instances, it has been necessary to build a regulating station in a residential area where development is in the early stages but the ultimate load and service area can be well defined. In one such instance, the company purchased a two-lot tract, 50 ft wide by 125 ft deep, and constructed a regulator station on the rear 20 ft. The front portion of the tract was sold and a residence constructed which was tied in with the regulator station building in such a manner that no separation can be observed between the two structures. In fact, we have frequently driven visitors to within 100 ft of this location, told them that they could see the regulator station, and not one time in ten has the station been identified.

Fig. 2 is a photograph of this station as originally constructed in 1937, at the time the area was ready to develop. *Fig. 1* is a later photograph of the same station taken from a different angle, showing how the station building was incorporated into the residential structure. The floor plan of the residence is such that a two-car garage is between the station building and the living quarters, with the solid masonry garage wall spaced 2 in. from the station building. Edges of the garage overlap the station building by about 2 in. to obtain a single structure appearance. A false roof ex-





FIGS. 8, 9, 10 and 11. From top to bottom: Fig. 8 is a doll house type of station erected in the vicinity of a housing tract. The architectural style conforms with the whim of the tract owner. Fig. 9 shows the same station at the rear of the new dwelling. Fig. 10 is a garage-like structure built by the company to include not only the station, but also, as the price of a 20-year lease, a bedroom for the lessee. Fig. 11: A 6-in. precision lathe for a mechanically inclined home owner bought the ground on which this station stands.

tends from the garage over the station building.

Fig. 8 shows a doll house type of station building, erected in a residential area where development was just getting under way. The company purchased a plot of ground about 25 ft square at the rear of a two-lot tract. The architectural style conformed with the wishes of the tract owner. *Fig. 9* is a more recent picture of this station, showing how inconspicuous a rear lot location can be.

Special circumstances made possible the construction of the station shown in *Fig. 10*. The home had a front drive garage. The owner wanted an additional bedroom. His problem and ours were solved by building on the rear of his lot the equivalent of a double garage, with a central fire wall dividing the building into two sections. One section, about 12 ft by 20 ft, is used as a regulator station. The other section is used by the home owner as his new garage, and his former front drive garage is now the extra bedroom he wanted. The structure shown was built by the company at its expense, deeded to the home owner in return for a lease on the portion occupied as a regulator station. The lease requires a $10 a year rental fee, is for 20 years, with renewal privilege for a like period. We prefer, however, to own the ground on which our permanent stations are built and in only two situations do we occupy rented plots.

In an older residential section, where no vacant property was available within a radius of a mile from the point where a regulator station was needed, a plan was worked out with a home owner wherein we built and deeded to the home owner a two-car garage, in return for which a plot adequate for a station was deeded to the company.

This station, shown in *Fig. 7*, placed in operation in November 1950, serves an area with a peak hour load of 500 Mcf. Located on a paved alley, it is readily available at any hour of the day or night. *Fig. 6* shows this station during early construction. The party wall separating the garage from the station portion is on the company-owned tract, so subsequent demolition of the garage would not materially affect the station itself. It will be observed that the interior of the station portion is faced with salt glaze brick. We have found this simplifies cleaning and eliminates painting. Cost increase is small.

In a few cases, acquisition of a station site has been aided by side issues. *Fig. 11* shows a station built on a 15 ft by 20 ft tract of ground purchased from an owner who is a home craftsman and who had his eye on machine tools which at the time would have embarrassed his pocket book. The purchase price of the plot now stands in the home owner's basement as a 6-in. precision lathe.

In some instances, sound insulation has been installed at the time of station construction to prevent noisy annoyance to neighboring householders and, where manual operation of the station will be required for any period of time, to protect our operators. We have used acoustical fibreboard on the station ceiling, covered piping and equipment with various kinds of insulating material and tried other means, all of which have been effective. Usually, no sound insulation is used until need for it develops.

In recent years, several large-scale residential developments have been started. Where an area will require a regulator station, arrangements for a station site are always negotiated during the first contacts with those sponsoring the development. It has been our experience that a desirable station location can be obtained more easily and at less cost while the housing developments are in the initial stages.

The decision to locate regulating stations aboveground wherever possible was made shortly after natural gas reached Denver. Experience has shown this decision to be a good one. Greater ease of access to aboveground structures under all conditions of weather have made possible better operation. Operating hazards have been greatly reduced. Costs of increasing equipment size, to meet load growth, have been less.

In several locations it has been desirable to include in the station structure a reporting room for customer service employees. This has resulted in a reduction in total investment otherwise required, or at slight extra cost has improved facilities for operating department field men.

Four-Step Program Helps Oklahomans Upgrade Househeating Installations

By EARLE E. GARRISON

FOR the past several years the Oklahoma Natural Gas Co. has been aware of the need to further indoctrinate its customers with the desirability of upgrading heating installations. From our experience it seemed apparent that the best approach was to educate the public to understand and then demand better installations and applications of their heating equipment.

Exclusive

In a locality where appliance merchandising is not permitted to the utility, it was necessary that someone be established as a responsible authority —an authority that could and would make recommendations on selection of equipment, design, and layout, and then follow through to insure proper installation in line with the recommendations made. As the bulk of this responsibility falls into the lap of dealer-installers, it was necessary that we sell our heating program to them to instigate installation standards that would be beneficial to all concerned.

Upon determination of the requirements we decided to effect a program built around these features:

1. A model ordinance for adoption by cities and towns served by Oklahoma Natural in which good practice would be established in regard to sizing of service lines, definition of common terms, functions of the utility, appliance installation, venting practices, and allied data that were important to each and every installer of equipment, the customer, and the city concerned.*

2. A series of educational lessons directed to all company personnel, regardless of their functions, to establish the need for their awareness of the factors involved in good heating practices and to improve their knowledge of what "heating comfort" consists of and why it is important to each customer.

3. An educational program designed for and directed to the architect, builder, plumber, installer, and allied personnel interested in the promotion and installation of all types of good heating equipment, the purpose of which would be to establish the basic fundamentals of proper combustion, sizing, venting, use of controls, and the need for proper selection of equipment.

4. A promotional brochure, directed to the customer personally, to enable the prospective buyer and user to have further knowledge and a basis of comparison in the selection of the most desirable fuel, types of equipment available to him, and proper installation and venting procedures, and to educate him to the necessity of basic requirements involved in obtaining the heating comfort he is paying for and rightly deserves to receive.

*See *GAS*, January 1948, p. 45.

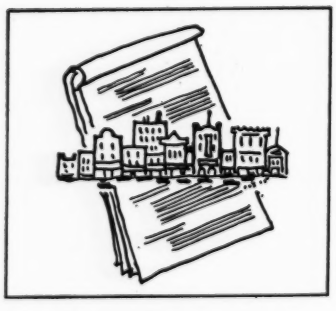
It is my thinking that the basic requirement in installer and customer acceptance of a program of this type requires that an authority be established —one that will truthfully and unselfishly place the needs of the customer ahead of bad installation practices, limitations of the building authorities, or short-cuts that will possibly reduce the degree of comfort the customer is obtaining. In most states where gas utilities are permitted to merchandise heating appliances, we find they are accepted as the leading authority in these desirable installation practices and justify the position they have earned with their intelligent and efficient manner of recommending and supervising the heating installation.

No Merchandising

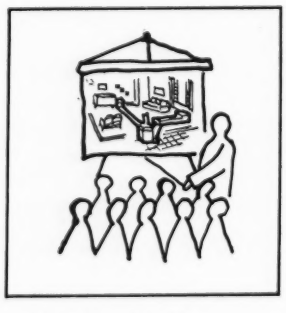
In Oklahoma the non-merchandising utilities, while keenly aware of the existing conditions, have until recently been handicapped in their attempts to establish themselves as leaders in the field of comfort heating with the authority and desire to justify the customer's complete confidence in their recommendations. Too often have we appeared to be at cross-purposes with the installer that we were trying to help when the installer was certain that by following our recommendations and proper installation practice, he would be priced right out of the picture.

With this always in our minds, we started our educational program. We have now carried out steps one, two and three with pleasing results, and our efforts are now being directed toward completing the informational brochure for use of the customer. We hope to

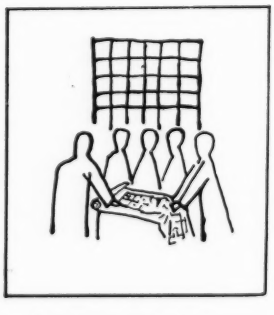
Four-Step Program for Upgrading House Heating



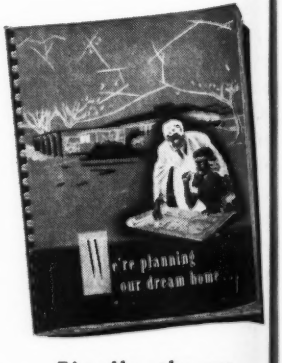
1. A model ordinance, designed for adoption by towns and cities in the system, and a gas heating service manual for gasmen and dealers were made up.



2. An educational program was developed to assist each utility employee to understand the problems involved in upgrading house heating.



3. Equipment dealers, plumbers, and installers were given a specially designed educational course to interest them in selling better equipment.



4. Finally, the customer himself was educated through the medium of a colorful brochure designed to stimulate his desire for better equipment.

place at his disposal sufficient basic requirements of the factors of comfort heating to insure his seeking further knowledge relative to his equipment and its installation.

All too frequently we are called in to make recommendations on equipment that is not performing satisfactorily, only to find that the very best of equipment has been improperly installed. The installer argues that he did the job in accordance with the requirements of the builder, or the architect, or in accordance with his expense limitations, knowing full well that it was an incorrect application.

Tell the Consumer

So let's tell our story to Mr. and Mrs. Consumer. Why should they not also be aware that they have a choice in the type of fuel they should use? Gas has availability, independent of weather conditions, market fluctuations, and similar factors. It is clean, since all of the fuel is consumed in producing heat and no residue remains; it is economical, requires less investment in equipment and no storage space, and it is more economical in its use. Gas is high in operating efficiency and is the ideal fuel for use with automatic controls.

We can also acquaint them with an estimate of costs, pointing out that the American Institute of Architects and most trade journals have universally accepted the fact that the cost of a good heating system, properly installed, will approximate 10% of the cost of construction of the home. And these figures are applicable to installations in both the sunny South or upper New York state.

The awareness that there exists a wide choice in types of heating systems should also assist in upgrading the selection of equipment. By giving the customer additional information concerning requirements, adaptability, flexibility, and positive temperature control, you will insure his consideration of several different types of systems and permit him to make a more logical selection of the system that he requires to fully satisfy his degree of heating comfort, whether it be a radiant, forced air, gravity, or vented circulator system. By establishing the capabilities, installation requirements, and space requirements for each type, he will have definite information from which to develop a logical choice of equipment that will satisfactorily fulfill his heating comfort requirements.

By establishing the need for proper location of equipment, needed room for servicing, and an adequate supply of fresh air for combustion and venting, we can further assist our user in planning his home.

One of the most neglected factors, yet by far the most important to the customer, is that of venting. This problem is important during the planning stage of the construction and a few simple rules are essential if practical and efficient operation of the heating plant is to be obtained. Unless the customer is informed of the rules of the game, he is left in the hands of the installer who may or may not provide the user with the very best, or because of construction, the installer may be unable to provide a satisfactory and workable solution. Principal factors to be followed to insure good venting are the following:

1. Provide a masonry chimney properly located.
2. Locate the appliance as close to the chimney as possible and never farther than 10 ft away.
3. Provide an entry for outside air sufficient for combustion and venting.
4. Comply with local regulations and codes in vent construction and material.

In addition, we should acquaint our customers with the necessity of adequate piping, sufficiently sized to provide the gas needed for all appliances; use of automatic safety and limit controls to provide efficient, economical and safe operation; and the desirability of insulation in walls and ceilings, and on all exposed ducts and piping systems, as well as weather stripping, to further increase the efficiency of the plant and provide additional economy of operation.

Drastic?

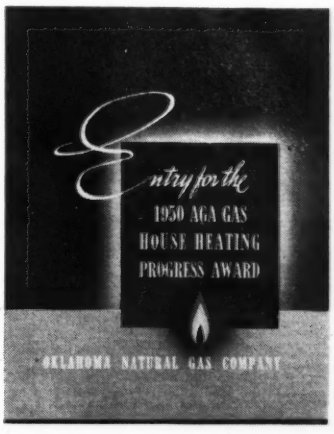
To the run-of-the-mill installer this approach may seem drastic, but experience has shown that reliable firms welcome this assistance as it demonstrates pictorially and in easily understood terms the story that they are also trying to tell their customers. With this information the gas user is in a position to establish his own minimum standards and to insist that his installation is a proper one. It will also prove of vital importance to the installer in other ways. He can bid on an installation knowing full well that he is not having to compete with other installers who can do the job at a lower cost by sacrificing efficiency.

Such a story can be disseminated by the gas utility, the retail appliance salesman, installer, builder, and the architect. In so doing they improve their own position and reputation with their customer while assuring him of receiving the very best.

Right the First Time

No longer will it be necessary for the gas utility, local inspector, or the dealer to be called back on a job to supervise or correct a condition that should never have been permitted in the first place. Possibly we can eliminate the old song, "Sure I know it's not the right way to do it, but it's the generally accepted way around here." Without trying to make heating engineers out of our customers, we can still provide them with sufficient background knowledge to assure their asking questions of the proper sources and in so doing we will be upgrading heating and assisting in better heating comfort.

The word authority has been used many times. I do not intend to imply that we have any ideas about establishing ourselves as a policing agency in regard to the installation practices mentioned. Nonetheless it is our desire to so thoroughly indoctrinate all parties concerned in the heating field with the concept of proper installation that policing will never prove necessary.



ANOTHER IN THE SERIES of articles built around prize-winning entries in the 1950 AGA House Heating Progress Award competition is this article by Earle E. Garrison of Oklahoma Natural Gas Co., El Reno. Mr. Garrison's entry won fifth prize at the AGA convention last October.

About the Brochure

"We're Planning Our Dream House . . ." is a complete, readable guide to home builders in selection of heating equipment. Three questions are answered: (1) What fuel should we use? (2) How much should our heating system cost? (3) What type of heating system do we need?

Advantages of gas over competing fuels are shown briefly and forcefully, a rule-of-thumb measure for determining the proper heating equipment cost is given, and a comprehensive comparison of the various systems is presented. Essentials of proper location of systems, venting, controls, and pipe sizing are also listed briefly.

After the customer has studied the booklet, he is invited to take his house plans to the gas company for further advice, before having the architect draw up final plans for the installation.

SECURITY... At The Company Level

What one gas utility is doing to guard its system in case of attack

By GORDON G. DYE

Some gas utilities are moving ahead at top speed to get their security programs tightened up in case of a major war. Some are moving ahead rather slowly, waiting for lumbering civilian defense organizations in their areas to shift into high.

Some simply aren't doing anything.

Most of the large utilities in key areas fall into the first classification. Southern California Gas Co., Los Angeles, is one; and how its program is shaping up (as to form rather than details, many of which cannot be discussed for security reasons) is discussed in this article written especially for GAS by Mr. Dye. An expert on distribution systems, Mr. Dye has spent considerable time working with the committees mentioned in the article, although he is not a member of either.

AN article in the March, 1951 issue of *GAS* discussed the mutual aid planning of the public utilities as a part of the state civil defense program under the California Civil Defense Act of 1950. The purpose of the present article is to supplement the former one by outlining the security planning of one specific company—the Southern California Gas Co.

Exclusive

A general understanding of the company and its operations is necessary to an evaluation of the defense planning; hence, a brief description of the company's system and operations is given.

Service Area

The area supplied by this company extends from just south of the city of Fresno to the Mexican border and from the Pacific to the Colorado. The Pacific Lighting Gas Supply Co. (a gas producing and transmission company), and the Southern California Gas Co. are affiliated companies. Together they supply gas to all of the state south of Fresno except Bakersfield (Pacific Gas & Electric Co.,) Taft (Coast Counties Gas & Electric), Long Beach (municipal), San Diego (San Diego Gas & Electric), and some small communities in the San Joaquin valley and on the desert. Natural gas is secured by these companies from oil and gas fields in the San Joaquin valley, the coastal districts, the Los Angeles Basin fields, and from Texas. Southern California Gas Co. serves gas to approximately 1.2 million customers in more than 200 communities through 12,500 miles of mains. The company owns and operates a number of compressor stations and storage plants but has no gas manufacturing plants in operation.

During World War II, the company developed a rather complete plan for the security of its facilities, services, and personnel, and while these plans were never called into use as a result of espionage, sabotage, or direct enemy action, they were judged to be sound and practical. A complete file of these plans, comprising 125 pages, was preserved. Present planning is following the same general lines as formerly since it seems reasonable to believe that the eventualities against which we hope to protect in the future differ from those of the last war mostly as a matter of degree. In the future we may expect greater destruction from a single bomb hit, and perhaps greater total destruction. Espionage and sabotage may be potentially greater hazards now than formerly, and possible contamination from radioactive materials has been added. Poison gas was a threat then as now.

Coordination

What, then, are some of the plans and implementations of this company. Of primary importance is the fact that a committee has been organized to coordinate all intra-company security planning and measures. On this committee are representatives from various departments such as transmission, distribution, customer service, engineering services, personnel, safety, public relations, and publications. Top management also is represented.

Some of the details of planning to date are given below under various headings:

1. *Cooperation With Other Agencies.* The company is, of course, cooperating with the state civil defense authority, with community agencies, and with other utilities.

2. *Mutual Assistance.* During the last war plans were developed for mutual assistance between Southern California Gas Co. and (a) the Pacific Gas & Electric Co. in the Bakersfield area. (b) City of Long Beach in that area and (c) with the Southern Counties Gas Co. and the Pacific Lighting Corp. The latter two and the Southern California Gas Co. are affiliated companies. At present, mutual aid is being planned on a much wider basis under the leadership of the California Civil Defense Authority. This is discussed more fully in the March, 1951 issue of *GAS*. The major gas utilities in the state have for many years worked together on mutual problems, gas supply especially, and consequently have developed organizations and understandings which materially assist in developing and implementing plans for mutual assistance under disaster conditions.

3. *Protection of Physical Properties.* It is, of course, physically impossible to fence, lock, or guard all the important facilities of a large, widespread gas utility, and such a plan would be impractical even if possible. However, during the last war some of the more critical, or vulnerable, plants and installations were fenced, lighted and guarded. Other facilities were fenced and locked only; some important valves and regulator stations were locked, and the regular patrolling of transmission lines, etc., was intensified. The same will be done again if and when circumstances warrant.

These measures, even when used to the fullest practical extent, provide a degree of protection against only sabotage and espionage and are quite worthless as protection from aerial bombings. Consequently, it was deemed of prime importance to develop some

means of localizing damage which might occur.

With this in mind, a study of the properties of the company was undertaken in 1941-42, plans were developed, and many physical changes made. In general, the plans have been continued to the present, though the properties are again being reviewed for items which have been overlooked, or otherwise omitted during the intervening years. The property owned by the company may be divided roughly into four classifications:

1. The property used in collecting, compressing, and transporting gas from the oil and gas fields to centers of distribution.
2. Property used in compressing, storing, and withdrawing gas from storage.
3. Property used in distributing gas from centers of distribution or storage holders to individual customers.
4. General property such as offices, garages, warehouses, etc.

Examination of the possibility of damage to collecting, compression, and transmission facilities indicated that no changes were required or were feasible. The protection of compressor stations from direct hits was manifestly impossible. The character of equipment and structures at all stations is such that sand bag, brick, or concrete protection against bomb blast or splinters would be extremely costly and would interfere with operations, and in many cases would be impractical. As to the pipelines used to transport gas long distances across deserts and over mountains, it was believed that they present so poor a target as to be relatively safe from aerial bombardment.

Physical Protection

With reference to property used to compress, store, and withdraw gas from storage, it was decided that physical protection was impracticable. However, in some plants, dependence is placed on electric power supplied by other utilities. To avoid shutdown in case of failure of supply of electric energy, gas engine, or steam driven generators and/or pumps were installed in certain vital places. In times of peace, it was customary to route major gas supply lines through manufacturing and storage plants, compressor stations and measurement stations. In order to avoid losing the use of such lines if a plant or key point were bombed or sabotaged, facilities were installed to by-pass gas around all such points. In some instances, extensive construction was required.

A study of the distribution system revealed two important facts: (1) the number and location of main line valves, while possibly adequate in peace time, did not permit sufficient localization of effects of a bombing; and (2) there was an insufficient number of alternate sources of supply for the large low and intermediate pressure mains. Detailed studies of the situation which were made in all districts resulted in the installation of several hundred additional main line valves throughout the distribution system. These valves were installed in strategic locations and an attempt was made to (1) make the districts separated by the valves as small as conveniently possible, and (2) make possible the shutdown of each district with the least number of valves. As a result of this "isolation district" program, there are now between 700 and 800 areas which can be completely isolated from the rest of the system. These areas naturally vary considerably in size. In some of the smaller districts there are as few as 200 customers, while some of the larger districts contain as many as 40,000.

Maps of and detailed instructions for shutting down each isolation district are up-to-date and available to field personnel. Furthermore, since an atomic bomb probably would cause damage in a wider area, plans and instructions have been prepared whereby two or more districts can be grouped quickly to shut down an area with a 2½-mile radius at least from any given point (center of hit).

Also, several crossovers were installed between main feeder lines and low or intermediate pressure mains.

General Property

In providing protection for general property such as office buildings, warehouses, etc., consideration has been given to the fact that destruction of one or more of such structures would be inconvenient but would not result in the discontinuance of service.

During the last war it seemed advisable to protect telephone switching equipment and switchboards from bomb splinters and flying glass. In some places windows were eliminated and operators were protected by tile walls. Generally speaking, such equipment and opera-

WORKING WITH CIVILIAN DEFENSE...

Coordination of effort with civilian defense authorities is a keystone in any utility's security program. Gas companies are unanimously arranging their schedules to conform to rules and regulations set up by the civilian authorities in their areas.

Consumers Power Co., Jackson, Mich., and its subsidiary, Michigan Gas Storage Co., are cooperating fully with the authorities. Cambridge (Mass.) Gas Light Co. is working with civilian defense at the city level through its plant defense director, the city level group cooperating in turn with an elaborate state CD setup reporting to Governor Dever. There the Civil Defense Agency has made available to all customers of the company a pamphlet, "Protection From Atomic Bomb."

This education of the customer is also being handled cooperatively in many other areas. In New Orleans, for example, information will be disseminated in conjunction with other literature emanating from CD.

As a part of the cooperative scheme, defense heads of utilities are generally members of the civilian defense executive group in the area.

In Cambridge, the company's defense director is attending educational sessions of the civilian defense organization to keep abreast of all new developments.

Direct telephone communications with CD headquarters are another feature of many security programs. The Gas Service Co., Kansas City, Mo., has nine control centers, each manned by a complete crew, with radio - telephone connection to CD headquarters. In Cambridge, gate guards have a direct line to the civilian center.

Consolidated Edison Co., New York City, has not only worked closely with CD, but has checked with representatives of the armed forces in formulating protective measures in those plants which the army has designated as critical. ConEd has found its problems in working with CD multiplied, since it has properties in several cities, no two of which operate under identical procedures.

Most companies, of course, have had to forbid their own personnel to sign up for outside defense duties, since they will be needed in their own jobs in case of emergency.

MUTUAL AID...

The idea of mutual assistance among utilities (see GAS, March 1951, pp. 36-37) is widespread. Nashville (Tenn.) Gas & Heating Co. reports it has signed up for the Southern Gas Assn.'s mutual aid plan. Cambridge is one of the New England companies that has joined in a working agreement set up by the New England Gas Assn.

Gas companies in the Northeast have found that the NEGA directory, published last year, is helpful in implementing such a plan. Copies of the directory in the hands of key men present a guide to them in soliciting help if needed. Since the directory lists home addresses and phone numbers of major officials of every member company, it is useful day and night.

Gas utilities are also cooperating with other utilities in their own area. The Gas Service Co., under CD direction, has been grouped with the power and water companies, with a representative of the telephone company for communications, so that operating procedures will be uniform.

MANUALS . . .

Concrete programs for defense should be on paper, in manual form. Portland (Ore.) Gas & Coke Co. is preparing an emergency operations manual consisting of about 300 pages of text, with a dozen chapters and 70 subsections. Company officials think it will be the most complete of any in the Northwest.

First an organization chart was set up to prepare and edit the manual. Subjects were assigned to each of the men listed on the chart; following preparation they were reviewed, edited, and re-edited. The entire publication is expected to be ready for distribution about May 1, at which time a permanent working organization chart will also be produced.

Many companies, of course, already had manuals covering emergency operations; these have been or are being revised, tightened, or completely rewritten. ConEd in New York, for example, already had an emergency plan which was put to good use in last November's hurricane. Now it's being strengthened and shaped to fit the needs of defense.

tors are still in protected locations, but much special fire fighting and first aid equipment, screens against flying glass etc., have been disposed of and have not been replaced. The magnitude and severity of damage from an atomic explosion tend to make one feel that such flimsy devices are worthless. In case of an atomic bombing, however, much property damage and personal injury will result from flying glass and fires which might be controlled, in a relatively large area between that of total destruction and that of no damage.

4. *Hypothetical Bomb Hit.* A number of locations have been selected and designated as hypothetical atomic bomb hits and hours of the days and days of the week for the hit specified.

Things to Consider

The operating and engineering personnel are currently working out solutions to these problems. They are determining for each case how large an area would have to be shut down and specifically which valves would be closed. Also, they are deciding how gas would be rerouted around a damaged area; how broken mains, valves, and damaged stations would be repaired; where field crews would report in case area operating bases are damaged or destroyed; what manpower, equipment, and materials would be required; whether available quantities would be adequate; and other related matters.

Time schedules are considered as well as total quantities ultimately needed. The primary object in working out these problems is to test for adequacy the planning which has been done thus far. It can be said that already some inadequacies have been revealed. Steps will be taken, of course, to remedy these as rapidly as practical.

5. *Mutual Aid Operating Team.* In cooperation with other gas utilities and gas supply companies in the Los Angeles area, a mutual aid operating team has been selected as contemplated by state disaster planning. Notification and call-out routine has been determined and reduced to writing.

6. *Instructions to Operating Personnel for Reporting to Duty.* The company has standing instructions for all operating personnel to report to or telephone their regular headquarters as soon as possible following any major disaster. Furthermore, an adequate coverage of key supervisors are on call, and call-out and notification lists of other personnel are available in dispatch offices of the company. Instructions have been issued to field and operating personnel as to what to do if air raid alerts or warnings are received or actual bombings occur. Both working and non-working hours are covered.

Protection for Employees

7. *Safety of Employees.* Plans are now being worked out for the safety of employees in office buildings, in case of an air raid during working hours. These plans will include notification to employees when reports are received from proper sources, monitors, moving employees to the better protected areas and possibly other matters.

8. *Emergency Materials.* The company, as a normal procedure, maintains stock piles of important repair materials and equipment at strategic locations for emergency use. These stock piles were reviewed from the point of view of security planning and any additions or changes which seem necessary were or are being made.

THREE D'S . . .

Dispersal, duplication, and decentralization are important words in the working vocabulary of gasmen.

Dispersal of records — particularly of maps and working drawings of distribution systems — is an important protective measure.

ConEd is making photographic copies of all basic records as a means of providing "standby" for records that might be destroyed in case of enemy action. Brooklyn Union is following the same sort of procedure, storing the duplicates in a remote location. The company has already copied 20,000 maps, 5000 personnel cards, and 400,000 records of gas services. Much of the duplication is done on microfilm. New Orleans has duplicated records of mains and services and placed them in a bank vault. Cambridge is still studying the possibilities of such a setup.

Cambridge is also laying out a schedule for dispersal of trucks and passenger cars if the need arises.

9. *Emergency Communications.* As a matter of operating convenience and economy, as well as to expedite the handling of emergencies, the company has operated a number of trucks equipped with radio-telephones. Also, it has had in operation a system of short wave radio communications to assist in handling gas transmission problems and emergencies of a wider incidence. The short wave radio system is being expanded considerably and coordinated with similar systems of the Southern Counties Gas Co. and the Pacific Gas & Electric Co.

BLOCKING SABOTAGE . . .

A move is afoot among most utilities to impose closer inspections and restrictions to prevent sabotage.

Smaller utilities, or at least those with concentrated properties, are literally mending their fences. Twenty-four-hour guards are the rule. Identification cards of various classifications are being issued to personnel. Passes for visitors and contractors' employees are being issued. New employees are being screened, and fingerprinting is being instituted. Vehicles are being marked for passing into restricted areas. Gate guards are being provided with direct lines to civilian defense headquarters.

Cambridge Gas Light has replaced old locks on certain key installations with new ones and has issued keys only to certain designated officials.

10. *Coverage of Community and Local Civil Defense Meetings.* The company makes an effort to have a representative, usually a non-operating supervisor or staff employee, attend community and local civil defense meetings for the purpose of observing and reporting developments. While there is no way of being sure that the company receives notice of all such meetings, it is believed that employees in the local areas are well enough acquainted and sufficiently informed as to community activities to know of most cases.

Operating personnel have been requested not to register for service with local agencies when such service might interfere with their reporting to their regular company posts for duty in emergencies or when warnings are received. The usual explanation to the local agencies when gas company employees decline to take regular assignments is that in case of an emergency or warning the employee will have a regular assignment with the company. Consequently, if he accepts an appointment on the community agency, he will, of necessity, disappoint either the company or the community when an emergency does arise.

HIP ACTION

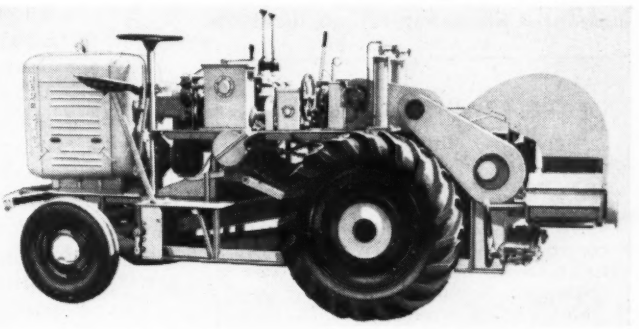
Eliminates Undercutting on Lateral Slopes up to 30%

An exclusive feature of the

LONGHORN
MOBILE DITCHER

Finger tip hydraulic controlled "hip-action" of the rear wheels enables the operator to level up and dig a vertical ditch on lateral slopes up to 30 per cent *without leaving his seat*. Each rear wheel is independently adjustable 7 inches up or down from center thus allowing one wheel to run on a level 14 inches above or below the other and still dig a vertical ditch without undercutting. No other ditcher on earth has such a feature.

Whatever type of small ditching you do, it will pay to get the complete Longhorn story. Why not write, wire, or phone for all the details.



And look at the other advantages a LONGHORN DITCHER has:

MOBILE

Pneumatic tires, a foot brake, and a road speed of twenty miles per hour. Driving to and from jobs over any kind of road is quick and easy.

VERSATILE

Built to fit almost any digging condition. The Longhorn Mobile Ditcher can make 6", 8", or 12" trench up to 48" deep at digging speeds from 1 to 25 feet per minute.

COMPACT

One man operated. Without moving from his seat the operator drives the machine, adjusts the "hip-action," raises or lowers the boom to desired depth, and reverses the soil conveyors to pile the soil on either side.

ECONOMICAL

Users all over the country are praising Longhorn Ditchers for their low per foot trenching cost and maintenance.

RUGGED

Built for hard, continuous use, the Longhorn takes long operations in its stride. All drives are on sealed ball bearings. The chassis is borne on Timken tapered roller bearings and gears run in oil.

Longhorn Industries, Inc.

P. O. Box 350 Phone 4535

Henderson, Texas

11. *Company Civil Defense Training Activities.* During the last war the company designated its employee training staffs to conduct training and lecture courses dealing with the various phases of civil defense activities. The subjects, in general, dealt with incidents affecting natural gas supply, control of fire and leakage, and public safety. This training was directed toward both the general public and the operating personnel of the company organization.

Training Procedures

The procedure consisted of enrolling instructors of the employee training staffs in official classes and demonstrations conducted under the auspices of the United States Army and the Civilian Defense Council. After such qualification, courses were administered by the respective qualified instructors to selected groups of employees whose emergency duties would most likely require knowledge of the subject in question.

Instruction for the general public consisted of conducting illustrated lectures to air raid wardens, service groups, and others engaged in civilian defense activities, advising them on proper procedure to observe in handling incidents involving natural gas.

Through the local Office of Civilian Defense, instructors of the company's training staff were enrolled for the regular course of training in the use and care of gas masks. Following this, classes of company employees were organized on the basis of probability of exposure in connection with their emergency duties, as mentioned above.

Through the local civilian defense organization of the respective counties served by the company, company instructors were permitted to take part in the regular air raid warden training program. This project consisted of a one-hour illustrated lecture covering natural gas facilities and emergency procedures where natural gas incidents were involved.

Such programs were presented substantially in three phases. The first phase outlined for the air raid wardens' general interest, the type of emergency program set up by the company which was designed to coordinate its emergency activities with those of civilian defense. The second phase was a discussion of natural gas facilities and was intended to give the air raid wardens a background knowledge of such facilities. This, in turn, would help them to understand the reasons behind the third phase — suggested emergency procedures.

At such meetings, the emergency bulletins prepared by the gas company, but carrying the local civilian defense heading, were distributed to all in attendance. In this manner, 25,000 air raid wardens and other persons engaged in civilian defense activities in Fresno, Tulare, Kern, Los Angeles, San Bernardino, and Riverside counties were contacted. In addition, 25,000 bulletins were made available to the Los Angeles city defense organizations for distribution to air raid wardens and other civilian defense workers.

Knowledge Passed On

Instructors of the company employee training staffs were enrolled in the bomb reconnaissance school conducted in Los Angeles by the U. S. Army. Also, these instructors attended officially recognized civilian defense schools and brought back to the company the knowledge they had gained.

The company prepared a course of training for fire department personnel to familiarize them with the natural gas facilities of transmission and distribution, the properties of natural gas and liquefied petroleum gas, to recommend methods of procedure where gas fires were involved, and to outline the emergency plan of the gas company.

The company is ready and willing to work again with civil defense agencies along similar lines at the convenience of the local civil defense agencies. As a matter of fact, discussions with some of the local fire departments regarding properties of natural gas and the handling of emergencies are now in progress, though for somewhat different reasons.

DECENTRALIZATION...

Here's how the Gas Service Co., Kansas City, Mo., is proceeding with decentralization:

Greater Kansas City is being divided into nine subsections, with a control center for each, manned by a full crew with assistants for 24-hour operation. Each control center receives its orders via radio-telephone from the central office, located at CD headquarters.

Each subsection will be a complete "combat" team with all elements represented to care for personnel, plant protection, communications, supplies, transportation, dissemination of information to the customers, shutoffs, explosions, and outages in the bomb-damaged areas.

SPLITTING SYSTEMS...

Sectionalization of systems is general in the gas industry, but even further sectionalization is under study. Michigan Gas Storage Co.'s largest compressor station has been built in two parts, either of which can be operated independently should the other be damaged.

12. *Information for the Public, Customers, and Employees.* The company has established a policy of keeping the public, customers, and employees informed on the general aspects of its security planning. Judgment must be exercised, of course, lest information be released which might be of assistance to an enemy.

13. *Employee Identification and Emergency Passes.* During the last war a system of employee passes was established. Each employee was issued a tamper-proof identification card bearing his signature, picture, and other personal data such as weight, height, age, color of hair and eyes. The card carried the company's name and was signed by the employees' supervisor and another representative of the company.

Some time after the war the practice of preparing this identification card for each new employee was discontinued, although the cards in existence were retained by the employee. Such employee identification cards are now being supplied to field personnel who do not have them.

INFORMATION PIECES...

Consolidated Gas Electric Light & Power Co., Baltimore, has prepared two information pieces which it is circulating.

"What to Do in Case of Atomic Attack" is an instruction sheet for employees, summarizing the work done by the company in protecting its property and records. This was distributed to 7000 employees as an insert in the company's employee magazine, "Folks."

A card titled "What to Do About Gas and Electricity in an Air Raid" has been distributed to contact personnel, and 400,000 have been mailed to customers.

The company will fit in with whatever system of emergency passes that is adopted by the state and local civil defense authorities.

14. *Coordinate System for Maps.* To assist in defining damaged areas, locating these on maps, and in relaying information, a system of coordinates was applied to company maps during World War II. The index maps with the coordinates are still preserved and should be useful in the present situation as they were formerly.

While the foregoing review gives an idea of security planning thus far by Southern California Gas Co., it is not intended to indicate that the measures outlined are complete or final. Both the gas system planning subcommittee (an inter-company committee affiliated with state civil defense and mutual aid planning) and our own intra-company committee are active. Plans and action are progressing daily.

Here's a Conversion Gas Burner you can install with confidence!

AGA-certified for natural, artificial and mixed gas fuels. Capacities from 75,000 to 300,000 Btu per hour.

The Delco-Heat Gas Burner— A Product of General Motors

Combustion is full and clean with the Delco-Heat Conversion Gas Burner. It's an economical, quiet-operating burner, too—with a simplified, flexible design that makes it a cinch to install!

The Delco-Heat Gas Burner is an up-shot, single-port type, with a stainless steel flame spreader for long life. Air and gas are mixed for complete combustion through a telescopic venturi. This telescopic feature, plus the adjustable orifice and simplified over-all design, make the Delco-Heat Burner completely adaptable to almost all furnaces or boilers with either round, square or rectangular fire boxes. In coordination with genuine Delco-Heat thermostatic controls, it will automatically provide quiet, efficient, dependable heat, and will maintain an even, healthful temperature in the home.

All the comforts and convenience of modern gas heat

Every time you install a Delco-Heat Conversion Burner you are giving the customer a burner that is amazingly low in first cost—economical to operate—built for years of service—and made to operate with carefree convenience and complete safety. The Delco-Heat Gas Burner is a real General Motors value!

Completely adjustable. Telescoping venturi and burner tube and adjustable feet make installation in almost any furnace or boiler easy!

Stainless steel flame spreader directs flame evenly to all sides of combustion chamber.

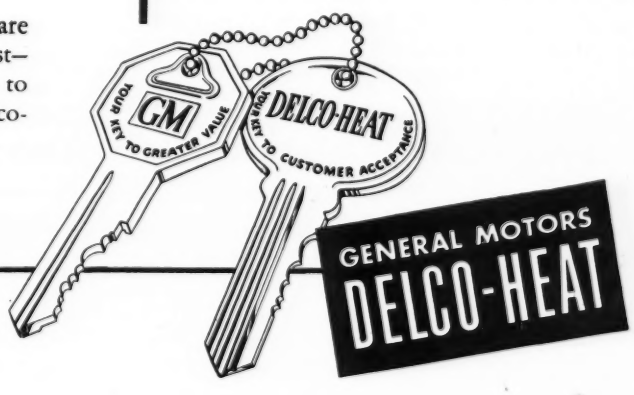
Automatic safety pilot assures ignition of gas from main burner...prevents flow of gas to main burner when pilot flame is extinguished.

Automatic main control valve supplies gas to main burner when room thermostat calls for heat.

Automatic pressure regulator maintains correct gas pressure regardless of normal variations in supply line.

Manual shut-off valve shuts off gas supply to main burner. Pilot remains on.

Electric pilot lighter—optional and extra—provides push-button lighting of pilot.



YOUR KEYS TO GREATER PROFITS

DELCO APPLIANCE DIVISION
General Motors Corporation
Rochester 1, New York

Manufacturers of complete lines of automatic home heating equipment and electric water systems

ESTIMATED PROVED RECOVERABLE RESERVES OF NATURAL GAS IN THE UNITED STATES

(Millions of Cubic Feet - 14.65 psia, at 60°F)

	Changes in Reserves During 1950					Reserves as of Dec. 31, 1950				
	Reserves[b] as of Dec. 31, 1949 (1)	Extensions and Revisions[b] (2)	Discoveries of New Fields and New Pools in Old Fields[b] (3)	Net Change in Underground Storage[c] (4)	Net Production[d] (5)	Total (All columns less "Net Production") (6)	Non-Associated[e] (7)	Associated[f] (8)	Dissolved[g] (9)	Underground Storage[h] (10)
Arkansas	874,190	65,072	23,129	540	55,338	907,593	450,935	157,869	296,789	2,000
[i]California	9,991,635	225,279	71,840	4,028	532,396	9,760,386	2,702,746	2,286,788	4,751,693	19,159
Colorado	1,227,095	(-) 134,453	41,426	0	18,595	1,115,473	474,704	33,528	607,241	0
Illinois	233,192	26,774	5,700	0	35,773	229,893	5,643	15,000	209,250	0
Indiana	25,200	6,720	4,920	750	6,400	31,190	4,000	5,000	21,440	750
Kansas	14,089,560	64,729	30,360	153	393,968	13,790,834	13,381,105	152,189	228,239	29,301
Kentucky	1,349,397	49,294	8,200	(-) 908	75,400	1,330,583	1,254,997	0	64,000	11,586
[i]Louisiana	26,687,811	2,010,120	751,133	0	915,798	28,533,266	22,477,745	4,162,574	1,892,947	0
Michigan	214,911	(-) 14,820	2,741	10,528	18,286	195,074	121,867	0	40,906	32,301
Mississippi	2,528,969	130,470	5,030	0	145,263	2,519,206	1,772,969	410,436	335,801	0
Montana	803,471	34,951	0	2,402	43,463	797,361	722,647	44,799	25,421	4,494
Nebraska	8,063	9,028	28,073	0	1,058	44,106	14,886	21,213	8,007	0
New Mexico	6,241,003	866,625	124,404	6,883	248,245	6,990,670	3,978,271	2,098,103	896,210	18,086
New York	66,685	200	0	1,094	3,200	64,779	53,375	0	595	10,809
Ohio	652,571	38,751	7,900	6,840	47,200	658,862	550,548	0	34,500	73,814
Oklahoma	11,625,979	486,813	121,163	8,250	607,918	11,634,287	7,509,209	1,011,782	3,088,927	24,369
Pennsylvania	621,680	31,000	50,000	(-) 509	75,000	627,171	528,569	0	40,750	57,852
[i]Texas	99,170,403	5,055,893	1,557,691	490	3,380,400	102,404,077	71,529,387	17,646,015	13,228,185	490
Utah	65,577	8,196	15,112	0	4,133	84,752	76,331	0	8,421	0
West Virginia	1,715,233	105,152	21,750	13,540	205,000	1,650,675	1,513,009	0	81,500	56,166
Wyoming	2,173,677	96,631	2,749	220	78,288	2,194,989	1,481,156	128,456	584,864	513
[a]Miscellaneous	15,042	9,956	4,030	0	1,556	27,472	24,356	0	3,116	0
	180,381,344	9,172,381	2,877,351	54,301	6,892,678	185,592,699	130,628,455	28,173,752	26,448,802	341,690

[a] Includes Alabama, Florida, Maryland, Missouri, North Dakota and Virginia.
[b] Excludes gas loss due to natural gas liquids recovery.
[c] The net difference between gas stored in and gas withdrawn from underground storage.
[d] Net production equals gross withdrawals less gas injected into underground reservoirs; changes in underground storage excluded. December production estimated occasionally.
[e] Non-associated gas is free gas not in contact with crude oil in the reservoirs.
[f] Associated gas is free gas in contact with crude oil in the reservoirs.
[g] Dissolved gas is gas in solution with crude oil in the reservoirs.
[h] Gas held in underground reservoirs for storage purposes only.
[i] Includes off-shore reserves.

Record Natural Gas Production Fails to Match 1950's Gains in Proved Reserves

PROVED recoverable natural gas reserves on Dec. 31, 1950 were 185.6 trillion cu ft, an increase of 5.2 trillion cu ft over estimated reserves of 180.4 trillion a year earlier, according to estimates shown in a joint report of the Committee on Reserves of the American Gas Assn. and the American Petroleum Institute. These reserves are the highest on record and the gain over a year ago was registered over a record production of 6.89 trillion cu ft of natural gas during 1950. In 1949 production of natural gas was 6.24 trillion cu ft.

The AGA Committee on Reserves, headed by N. C. McGowen, United Gas Corp., estimated proved recoverable reserves of natural gas liquids also attained a new record of 4.27 billion bbls as of the end of 1950. This compares with 3.73 billion bbls on Dec. 31, 1949, and the increase was made despite record production of 227 million bbls of natural gas liquids last year. Crude oil reserves on Dec. 31, 1950 were estimated at 25.26 billion bbls, compared with 24.65 billion bbls at the end of 1949. The total estimated liquid hydrcarbon reserves on Dec. 31, 1950 were 29.54 billion bbls compared with 28.38 billion reported by the AGA a year earlier.

Discoveries of new natural gas fields and new pools in old fields accounted for an increase of 2.9 trillion cu ft last year, while extensions and revisions of previous natural gas estimates in existing fields accounted for 9.2 trillion cu ft. Estimated reserves of natural gas in underground storage at the end of 1950 were 54.3 billion cu ft greater than on Dec. 31, 1949.

Despite the increased production, proved reserves of natural gas and natural gas liquids were again reported to be larger at the end of 1950 than 12 months earlier. The increased production of natural gas was largely attributable to the opening of several new pipelines during the year and to the increased capacity of several existing systems. In addition, the impact of the defense effort has brought with it heightened industrial demands for natural gas.

SUMMARY OF NATURAL GAS AND NATURAL GAS LIQUIDS RESERVES

	Natural Gas (Mcf)	Liquids (Bbl of 42 U.S. Gal.)
Total proved reserves as of Dec. 31, 1949	180,381,344,000	3,729,012,000
Extensions and revisions of previous estimate	9,172,381,000	707,879,000
New reserves discovered in 1950	2,877,351,000	58,183,000
Net changes in "stored gas" during 1950	54,301,000	
Total proved reserves added (and net changes in "stored gas") during 1950	12,104,033,000	766,062,000
Total proved reserves as of Dec. 31, 1949 and additions during 1950	192,485,377,000	4,495,074,000
Deduct production during 1950	6,892,678,000	227,411,000
Total proved reserves of natural gas as of Dec. 31, 1950	185,592,699,000	4,267,663,000

AMERICAN-Standard
First in heating...first in plumbing
How to remodel a shabby old basement with the finest in warm air heating
ONE SIMPLE CHANGE in your cellar will transform it . . . and make every room in your house more comfortable at the same time. That change is the installation of an American-Standard Winter Air Conditioner (such as the famous gas-fired Mohawk in the Ben Avon Heights, Pa. home shown above.) There are types and sizes for every fuel and installation requirement — compactly built, attractively styled. Plan now to start your home modernization in the basement . . . with smart, labor-saving heating equipment by American-Standard. It's the finest, yet it costs no more.
Free — New 1951 Home Book. Ideas for bathrooms, kitchens and basements. Illustrated in full color. Brings you in one book money-saving facts you need on both heating and plumbing. Pictures a wide choice of kitchen sinks, bathroom fixtures, and heating equipment of all types available through heating and plumbing retailers who sell, service and install. Explains easy time payment plan for remodeling. Just use the coupon below.
American Radiator & Standard Sanitary Corporation
Dept. P31, Pittsburgh 30, Pa.
Please send me your free HOME BOOK.
Name
Street
City & State
In Canada: Standard Sanitary & Dominion Radiator, Ltd., 1201 Dupont Street, Toronto.
I am interested in:
Building
Modernizing
Heating:
Radiator
Warm Air
Plumbing:
Bathroom
Kitchen
Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

Ads like this help make satisfied customers for you, too!

■ Here's another of those striking American-Standard ads currently appearing in leading national magazines.

Featuring gas fired heating equipment for modernization, this full-page, full-color advertisement will be seen by millions. Many families right in your own community will doubtless be prompted to include gas heating in their remodeling plans . . . and to install an American-Standard gas fired heating unit.

Every such installation along your mains means more load for you . . . another satisfied gas customer . . . and lasting good will for us both. For every American-Standard unit is made to perform efficiently, economically . . . and dependably! Gas users can't buy a better unit at any price.

LOOK FOR THIS

MARK OF MERIT

American Radiator & Standard Sanitary Corporation · P. O. Box 1226, Pittsburgh, Pa.

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

NEWS

Financial

AGA Issues Rate Study Covering 1947-1949

Detailed information on gas rate changes during 1947, 1948 and 1949 has been compiled by a subcommittee of the AGA rate committee. F. M. Terry, Consolidated Edison Co. of New York, is chairman of the subcommittee.

Rate changes in 1949 were fewer in number than in 1948, according to the report, totaling 87 and 111, respectively. Since the 1949 revisions were largely upward however, a larger monetary increase was registered during that year.

Twenty-nine natural gas companies reported rate changes in 1949 with an overall revenue increase of about $14,390,000, compared with 11 companies reporting increased revenue of $3,730,000 in 1948, and 12 companies with an increase of $1.3 million in 1947. About 7000 customers were affected by 1948 natural gas company rate changes; in 1949 2.5 million customers of all classes were affected.

On the manufactured gas side of the picture, 38 companies obtained overall net increases of about $20,260,000 in 1949; 75 firms upped rates $27,870,000 in 1948; and 26 companies showed increases of $10,140,000 in 1947.

Regardless of rate changes, utility service costs have not contributed to the sharp rise in general cost of living, according to figures computed by the U.S. Bureau of Labor Statistics. From August 1941 through August 1950, living costs rose from 106.2% to 174% of the 1935-39 average. The bureau's index of the cost of gas and electricity stood at 97.1% of the 1935-39 average in August 1941 and at 97% in August 1950.

Westchester Properties Merged Into ConEd

As a part of a continuing program of corporate simplification, two subsidiaries of Consolidated Edison Co. of New York Inc., New York, have been merged into the parent company, following state public service commission approval of the move in mid-February. They are Westchester Lighting Co. and Yonkers Electric Light & Power Co., both in Westchester county.

Local administration at these properties will remain unchanged with Edward P. Prezzano as president and L. A. Scofield as vice president. Both have been elected vice presidents of ConEd and will direct the company's "Westchester division."

Frank J. Bischoff, former vice president and director of the Westchester companies, has been elected assistant vice president of ConEd. Other Westchester and Yonkers executives elected officers of the parent company are John P. McLoughlin, assistant controller; Carl L. Carlson, assistant treasurer; and Frank M. Nilan, assistant secretary.

E. P. Prezzano

L. A. Scofield

Texas Wellhead Price Plans Sent to Subcommittee

Last month the Texas house committee on oil, gas and mining voted to send to subcommittee measures calling for a price floor of 10 cents per Mcf on natural gas at the wellhead. The proposals offered by Reps. R. E. Blount and John E. Morrison were thus disposed of after a four-hour hearing.

Among proponents of the minumum price were G. W. Wilson, Sherman County Royalty Owners Assn., who said, "We've got to have some relief and if we can't get it from the state we'll get it from the Federal Power Commission," and Will Mann Richardson, Panola County Royalty Owners Assn. Mr. Richardson said his group feels "there's something wrong when a commodity sells on one side of the fence at one price and on the other side at another. One day," he warned, "we'll wake up and find our gas is gone."

Texas Gas Reduces Rates

Rate schedules filed in February by Texas Gas Transmission Corp., Owensboro, Ky., went into effect on March 1 and FPC has terminated its investigation of them.

The schedules, filed pursuant to a stipulation entered into by TGT's counsel and the FPC staff, reduce by $800,000 a year gas charges in the company's zones 3 and 4, which include sales to distributing utilities for resale.

In addition, Texas Gas agreed to pass on to its customers any rate reduction on gas delivered by Texas Eastern Transmission Corp. at Lisbon, La.

Record Sales in December

December gas sales by utilities reached an all-time high of 4654 million therms, an increase of 24.4% over the same month in 1949, the American Gas Assn. has reported. Previous high was recorded in January 1950 when 4325 million therms were sold.

Greatest gain was registered in the natural gas category: up 26.7% from December 1949. Manufactured gas sales dropped 8.1% and mixed gas sales rose 19.7%.

Utility sales for 1950 showed a 17.6% increase over 1949 sales — natural, up 19.4%; manufactured, down 3.5%; and mixed, up 8.9%.

Regulation

Rather Succeeds Hargrove As Gas Director for PAD

Secretary of the Interior Oscar L. Chapman last month chose Charles P. Rather, president of Southern Natural Gas Co., Birmingham, as assistant deputy administrator of the Petroleum Administration for Defense, in charge of matters involving transmission and distribution of gas.

At the same time, Secretary Chapman announced the resignation of R. H. Hargrove, Texas Eastern Transmission Corp., as acting assistant deputy administrator, and of Nelson W. Freeman, Tennessee Gas Transmission Corp., as acting director of PAD's Gas Division. Both had been serving on a temporary basis, pending the appointment of a permanent staff.

To enable him to "obtain advice and counsel from the gas industry, both natural and manufactured, in connection with the discharge of the defense responsibilities with respect to gas which have been delegated ... under the Defense Production Act of 1950," Mr. Chapman also appointed a 61-man Gas Industry Advisory Council composed of top executives of principal gas utilities in the United States.

Minnesotans Eye Gas Bills Before State Legislature

Two bills which would affect gas company operations have been introduced in the Minnesota legislature.

A Senate proposal that the state railroad and warehouse commission be given authority to test gas and electric meters and to fix standards of supply and service has not been heard by committee. A house bill, calling for a 3-cent tax per Mcf of natural gas and for gas rates to be filed with the railroad and warehouse commission, was to be heard by a subcommittee on taxation on March 21.

In Minneapolis, the city council's committee on ordinances and legislation recommended that the council call on the legislature to exclude the city from application of the senate bill. The house proposal was referred to the committee on public utilities for further study.

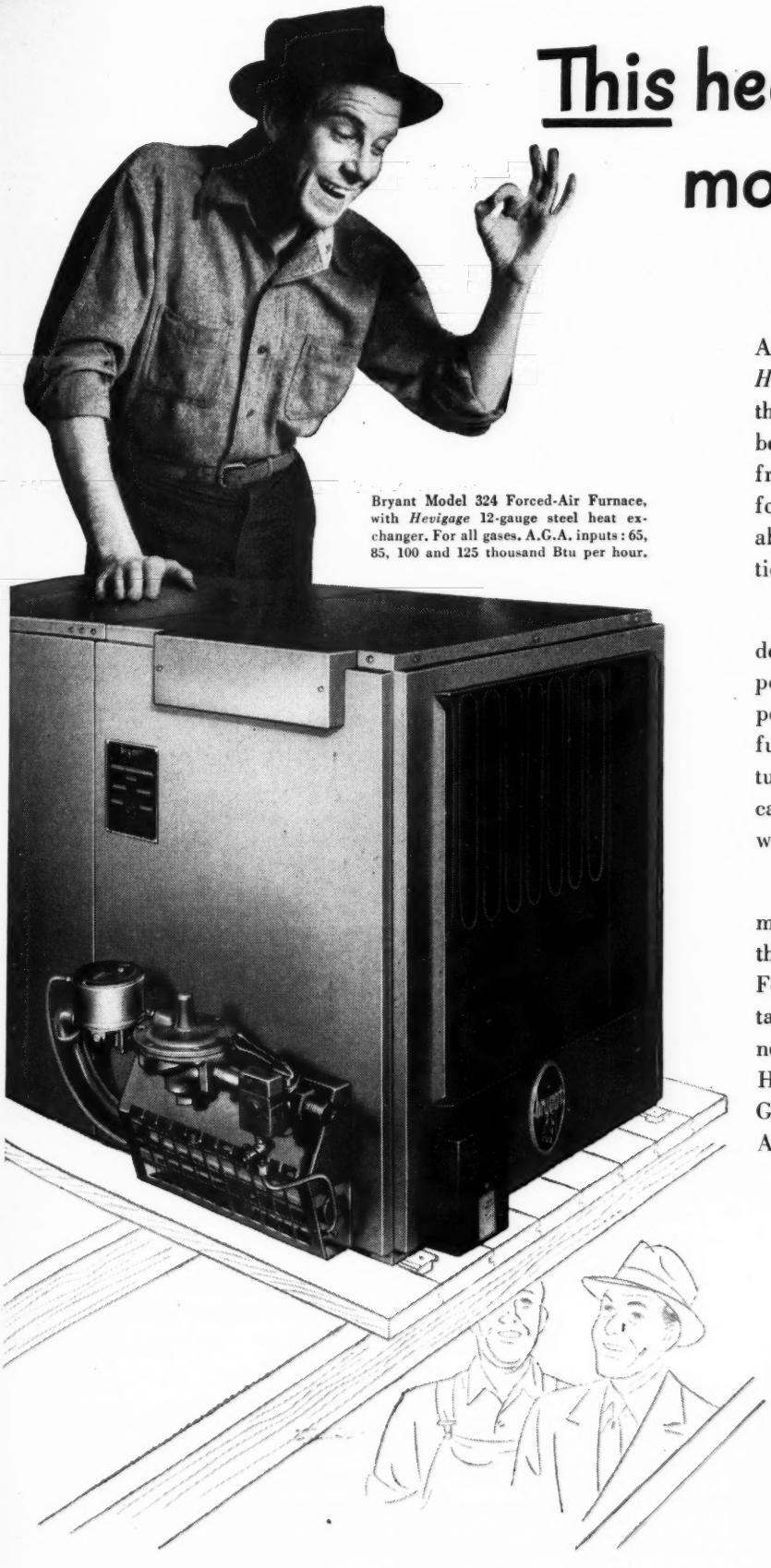
Nathan Harris, Minneapolis research engineer, stated that the tax bill would mean an annual burden of $900,000 on gas users in that city.

Phillips Hearing Date Set

An FPC hearing on the investigation of Phillips Petroleum Co.'s natural gas operations is scheduled to begin April 3 in Bartlesville, Okla. Originally set for Jan. 8, the hearing was delayed when Phillips filed a motion seeking continuance for the duration of the national emergency, alleging increased obligations in the defense effort.

Intervenors who expressed objections to a continuance in the case included the city of Detroit, state of Wisconsin, Wisconsin Public Service Commission; city of Kansas City, Mo.; and Wayne county, Mich. In sched-

This heating unit sells more *living* room



Bryant Model 324 Forced-Air Furnace, with *Hevigage* 12-gauge steel heat exchanger. For all gases. A.G.A. inputs: 65, 85, 100 and 125 thousand Btu per hour.

A truly great space saver like the Bryant *Hide-away* Forced-Air Furnace helps sell the idea of home heating *with gas*. It can be tucked away in the attic or suspended from ceiling or under the floor, releasing for storage, utility or *living* all the valuable space usually occupied by conventional heating equipment!

The *Hide-away* offers typical Bryant dependability and gas economy, with positive automatic control. Casing temperatures are *low*. Installation-wise, this furnace is easy to handle—and structural steel mounting channels provided can also be used to suspend the unit when it is so installed.

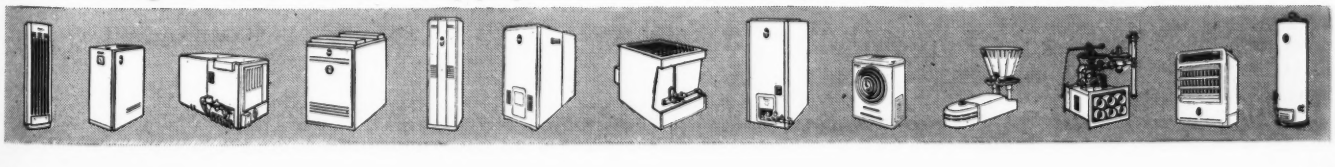
Help customers along your mains get more *living* space and better *heating* at the same time with the Bryant *Hide-away* Forced-Air Furnace! For complete details, contact the Bryant Distributor nearest you or write direct. Bryant Heater Division, Dept. 283, Affiliated Gas Equipment, Inc., 17825 St. Clair Avenue, Cleveland 10, Ohio.

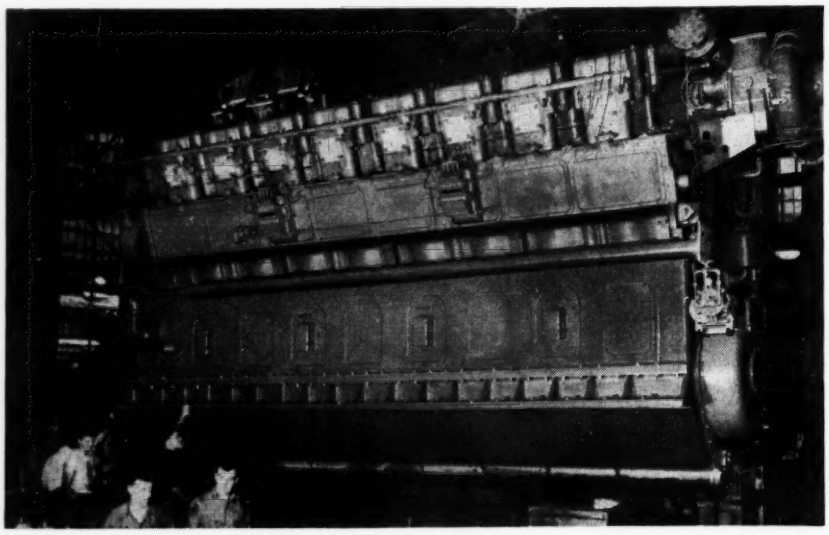
Let the pup be furnace man
... and water boy, too!

bryant

AUTOMATIC HEATING

Your *single* source of supply for everything in gas heating equipment!





An order for 40 of its largest, most modern supercharged gas engines, the biggest single commercial engine order in its history, was received last month by Cooper - Bessemer Corp., Mt. Vernon, Ohio, from Reynolds Metals Co.

Rush delivery is specified on the 3700-hp, Type LSV-16-SG giants, which will be installed in Reynolds' new aluminum reduction plant being built near Corpus Christi, Texas. Engine deliveries are to start in August, and the contract is to be completed by next January.

The power plants will comprise the largest electric generating project ever to be powered by internal combustion engines, according to Cooper Bessemer's Vice President Stanley E. Johnson.

Natural gas to power the engines will come from nearby independent fields. When the plant is in full operation, 48 MMcf per day will be used.

The engines, which are supercharged and spark-ignited, develop 3700 hp at 327 rpm and 135 lb bmep, a horsepower boost of 80% with fuel reduction of as much as 30% in comparison with other engines.

uling the hearing for this month, the commission said cause had not been shown to justify further postponement.

On March 7 FPC authorized additional petitioners to intervene in the proceeding: city of Milwaukee, Texas Independent Producers & Royalty Owners Assn., Port Neches Royalty Owners Assn., Old Ocean Royalty Owners Assn., numerous royalty owners in the Old Ocean field, Brazoria county, Texas; and the Independent Natural Gas Assn. of America.

Iowa-Illinois Plan Found Not Subject to FPC Rule

A pipeline to link two districts of Iowa-Illinois Gas & Electric Co., Davenport, Iowa, has been found by an FPC examiner to be a "facility for local distribution of natural gas" and not subject to provisions of the Natural Gas Act. The examiner's decision to dismiss the case is subject to review by the commission.

Iowa-Illinois previously had received temporary FPC authorization to build the 1½-mile, 8-in. crossing of the Mississippi between Bettendorf, Iowa and Moline, Ill. The $70,000 project is to be used intermittently to supply natural gas to either district as required.

Said the FPC examiner: "Congress intended that certain kinds of facilities are not to be classed, for jurisdictional purposes, as interstate facilities even though intersate movement of gas is involved, if their purpose is for local distribution of natural gas."

Load Building

Gas Used Inside and Out In "Home of Tommorrow"

Gas is, of course, doing five big jobs in the Home of Tomorrow, glamorous new model home on Wilshire boulevard in Los Angeles.

What's more, it's doing some additional jobs *outside* the house.

Inside it does the cooking, water heating, clothes drying, air conditioning, and refrigerating. But it also does a cooking, refrigeration, and heating job in the outdoor living area as well.

In southern California, where outdoor living amounts to a fetish, cool night breezes are liable to chase the occupants back into the house at an early hour. But in the Home of Tomorrow, a radiant heating system has been installed under the brick patio to keep the area comfortable at any hour. Hot water for the system is provided by gas-fired Day & Night boilers.

For ease and convenience in outdoor cooking, the barbecue is equipped with a built-in Western Holly automatic gas cooking top, a specially designed Servel refrigerator, and a gas-fired barbecue designed by Seabreeze Engineering Co.

Equipment in the inside kitchen includes an 11½-cu ft gas refrigerator, sectional gas cooking equipment with a counter-type top burner unit and eye-level broiler and oven, and a gas clothes dryer. Heating and ventilating is accomplished with a Chrysler Airtemp gas-fired unit.

The house was constructed by builder Fritz Burns on the same site as the celebrated Postwar House, which served as a "research laboratory."

Water Heater Market Swelled by Defense Needs

An annual need for 2,850,000 automatic water heaters under the defense mobilization program was told in a recent report issued by the water heater division of A. O. Smith Corp., Milwaukee.

Based on figures from the Dept. of Commerce, Bureau of Labor Statistics, and similar sources, the report showed that about 20 million such heaters were in use in the U. S. at the end of 1950, compared with 1½ million in 1937. Water is heated automatically in 57% of all single dwellings.

Annual production of replacement heaters for civilian and industrial use is 2 million units, the report stated, based on a conservative 10-year estimated life for a heater. In addition, according to the Bureau of Labor Statistics, 850,000 heaters are needed yearly for government and defense housing.

Fuel Oil Vendors Eye Gas Inroads in Home Heating

Fuel oil dealers were urged to band together to fight gas utilities in the home heating market in a recent issue of the *Coastal Oil Way*, published by Coastal Oil Co., Newark. The Fuel Oil Foundation has formulated a promotional program for various areas, the magazine reported, but it was deemed too early to judge the program's effectiveness.

Summarizing the activities of specific utilities in the house heating field, *Coastal* cited the accomplishments of Long Island Lighting Co. ("believes it can develop such a demand for gas that it will have no trouble obtaining customers as rapidly as its operations department can take them on"), Brooklyn Union Gas Co. ("an impressive promotional program" resulting in 8500 new installations granted since January 1950), Westchester Lighting Co. (plans to launch an intensive advertising and promotional campaign for gas heat), Elizabethtown Consolidated Gas Co. (converting its 87,000 customers in two counties to 1050-Btu natural and planning on 500 new installations this year), and Public Service Corp. of New Jersey (added 10,000 customers — increasing its total by 25% — during 1950, without any fanfare for gas heating).

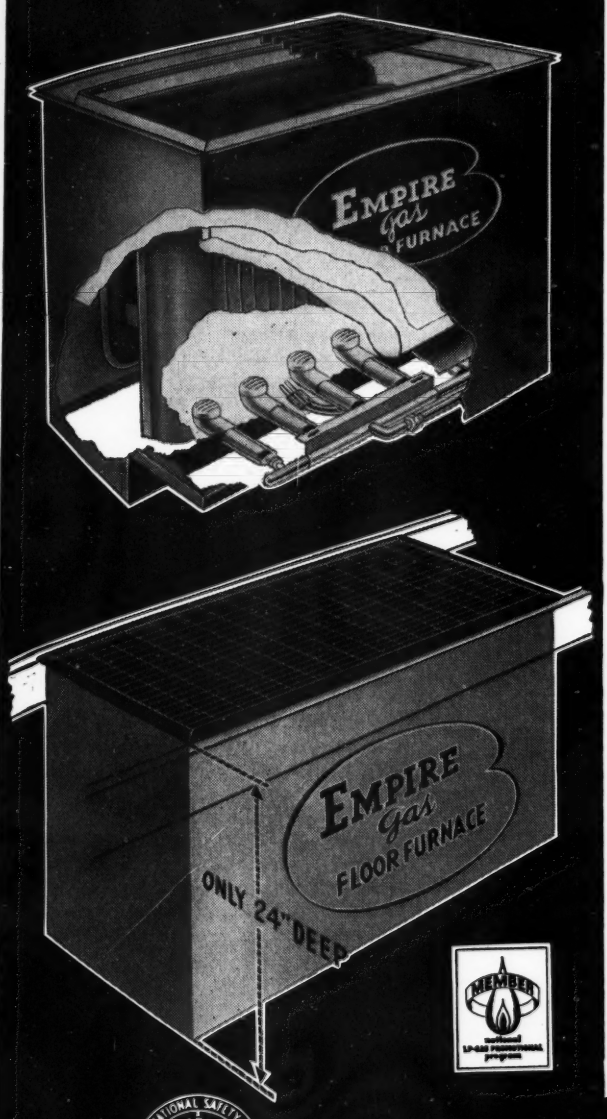
Asked the publication: "Will fuel oil go the way of coal?"

January Shipments Up

Shipments of gas ranges and automatic water heaters in January showed substantial gains over shipments during January 1950 — 36.4% more ranges and 73.3% more water heaters.

A recent GAMA bulletin reports that 225,100 ranges were shipped and 228,100 water heaters. Last year the respective figures for the month were 165,000 and 131,600.

TOPS IN ENGINEERING! FOREMOST IN QUALITY!

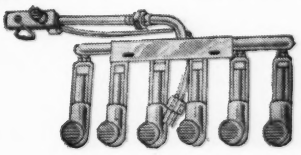


EMPIRE GAS FLOOR FURNACES ARE DESIGNED *for* SATISFACTION

- **ECONOMY AND EFFICIENCY** are prerequisites in this 24" deep floor furnace superbly designed for installation in new or existing homes.
- **LOW FIRST COSTS** result in increased dealer sales, greater profits. No expensive excavation or remodeling necessary.
- **EASY TO INSTALL** in homes with no basements — no air ducts required and only an attractive floor register is visible.
- **MINIMUM SERVICE CALLS** — All furnaces are factory tested and adjusted before shipment into the field eliminating expensive and time consuming call backs.

EXCLUSIVE WITH EMPIRE

The FAMED "Thriftmatic" *Gas* BURNER



APPROVED AGA

Designed and Patented by Empire, the Thriftmatic burner provides top efficiency and maximum economy. ENGINEERED for all types of gases — MIXED, NATURAL or L-P.

See your local EMPIRE REPRESENTATIVE or write direct to EMPIRE

EMPIRE STOVE COMPANY

BELLEVILLE, ILLINOIS

WORLD'S LARGEST MANUFACTURER OF *Gas* FLOOR FURNACES

MINNEAPOLIS
Honeywell
First in Controls

Robertshaw-Fulton Expands

Robertshaw-Fulton Controls Co., Greensburg, Pa., plans to build a manufacturing plant and office building on a 21-acre orange grove near Anaheim, Calif. The completed facilities will have 225,000 sq ft of floor space and will employ some 2000 persons.

The first unit, which is the only one contracted for, will have 58,000 sq ft of space and will cost between $900,000 and $1 million. Completion of the unit is expected sometime in May, and it will employ 300 or 400 workers.

Facilities of the new plant may be required for production of military items, according to John A. Robertshaw, president.

Refinery Supply Co. Sold

W. A. Schlueter, president of Refinery Supply Co., Tulsa, and E. P. Holder, chairman of Cenco Corp. and its affiliate, Central Scientific Co., Chicago, have announced the purchase of Refinery Supply by Cenco. No real estate is involved in the transaction.

Mr. Schlueter will continue as Refinery Supply president, and he has become vice president and a director of Central Scientific.

Refinery Supply will enlarge its field by handling the Cenco line and will maintain inventories at Tulsa to facilitate deliveries in the southwestern territory. Central Scientific Co. will handle Refinery Supply items at its various warehouses, insuring better service to more distant points formerly served from Tulsa.

Universal Range Handbook

To give new range owners complete and compact information, Cribben & Sexton Co., Chicago, is including with each purchase a 52-page book titled "Care and Use of Your Universal Gas Range."

Every phase of product use is covered, newest engineering features are explained and pictured, and a page is devoted to instructions for making minor adjustments and repairs. Even the firm's lifetime guarantee is incorporated in the book.

Thirty-two pages of tested recipes and a nutrition chart are also included.

Newsnotes

Stauffer Manufacturing Co., El Monte, Calif., is getting under way on an expansion program which will double the size of its building and will increase production facilities to twice those available in 1948. The firm manufactures pipe repair clamps and pipeline repair plugs.

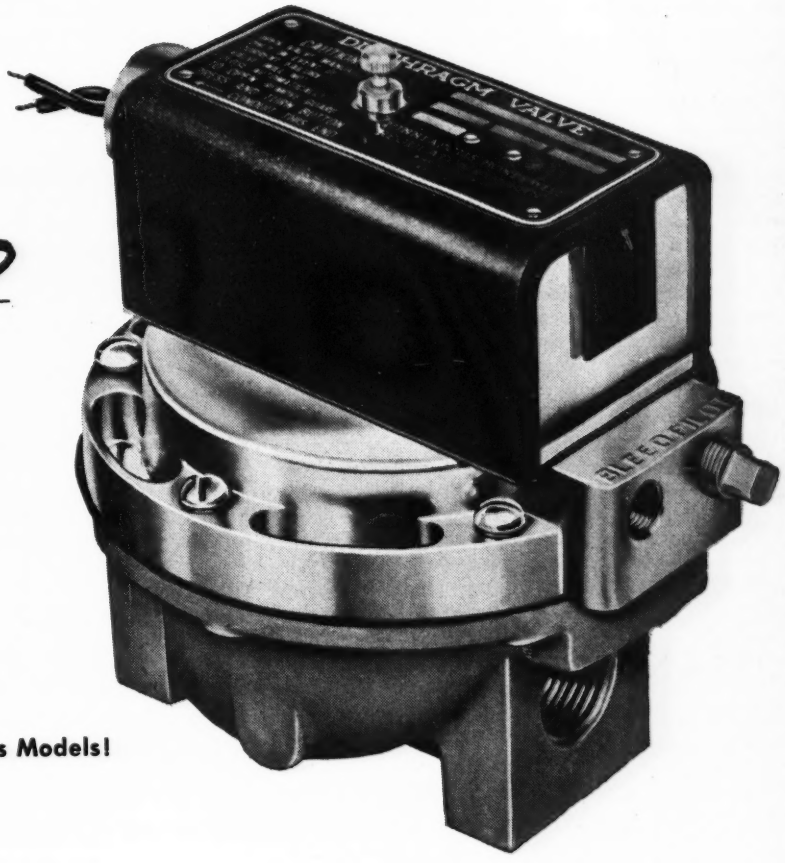
At a series of business management forums held in Toronto, New York, and Chicago, Timken Silent Automatic Division (Detroit) dealers were promised increased factory support on the firm's 93-model line of gas, oil, and coal-fired equipment. Rearrangement of manufacturing facilities is planned to enable the company to continue its regular production, in addition to extensive military

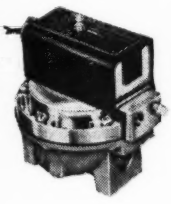
Announcing the

NEW, IMPROVED

Honeywell

Diaphragm Valve





Much Smaller Than Previous Models!

PERFORMS LIKE LARGE-SIZE VALVES – FITS FAR SMALLER SPACES!

You'll say it's a triumph of engineering when you try this new V899 Diaphragm Gas Valve! It's even more dependable than Honeywell's popular V148 and V149 models – and retains *all* the performance features you've liked. All components thoroughly field tested. It equals or *exceeds* these older models in capacity. Yet it's much smaller over all!

That means your men will make faster, more economical installations –particularly in hard-to-get-at places. Moreover, the new V899 is available in a full range of sizes from ¾" to 2" and is interchangeable with most solenoid valves. Manual opener with automatic recycling optional.

You'll want to switch to this new, better-than-ever model right away – and you'll need the full facts. So clip the coupon now – and mail it *today!*

MINNEAPOLIS
Honeywell
First in Controls

MINNEAPOLIS-HONEYWELL
REGULATOR CO.
Minneapolis 8, Minnesota, Dept. GS-4-67

Gentlemen:

Please send me complete installation and service information about your new V899 Diaphragm Gas Valve. I understand this places me under no obligation.

Name_____

Firm Name_____

Address_____

City_____ Zone____ State____

work. Plans for 1951 include increased advertising schedules, an expanded factory sales force, and new sales campaigns.

Appointment of Howard Suppply Co., Los Angeles, as exclusive California distributor for Carlon plastic pipe and tubing was announced recently. Sizes of Carlon rigid and flexible pipe range from ½-in. to 6-in., and tubing is available from ¼-in. to 1-in. OD.

A proposal to restore rate parities on westbound carloads of heating and cooking apparatus — including furnaces, stoves, ranges, radiators, boilers, water heaters, gas logs, and related articles — has been cancelled by Trans-Continental Freight Bureau's executive committee, according to a GAMA announcement. Under the application, rates would have been increased when necessary to restore parity with the highest rated point in related groups.

Berger Manufacturing Co., Pittsburgh, has acquired about 10 acres of land in Belle Vernon, Pa., and buildings which contain 200-000 sq ft of manufacturing space and are served by river and rail facilities. The company is installing equipment and tools and soon will be in production at the new plant.

A building which will provide an additional 75,000 sq ft of floor space for Day & Night and Payne Furnace divisions of Affiliated Gas Equipment Inc. is under construction in Monrovia, Calif.

POSITIVELY PREVENTS

DANGEROUS, COSTLY LEAKS ON ALL GAS CONNECTIONS

FIND OUT FOR YOURSELF
TRY A FREE SAMPLE of JOHN CRANE PLS

Write Dept. G4, 1839 Cuyler Avenue, Chicago 13, Ill., for your sample jar.

This **Underwriters' Approved** compound will be the solution to all your sealing problems.

One mid-west utility reports, "... it's the ONLY sealing compound that we have found which would retain its effectiveness after long periods of time on underground storage connections, and we have standardized on it as part of the kits for our servicemen, conversion crews and changeover crews".

PLS is completely unaffected by gas and soil. It will withstand the increases in gas pressures caused by change-overs from manufactured to natural gas... because it seals effectively at pressures up to 6000 psi and over.

PLS never hardens...which means easy dis-assembly after long periods of service...on underground, indoor or outdoor connections in all weather conditions.

JOHN CRANE
PACKINGS AND MECHANICAL SEALS
CRANE PACKING COMPANY
CHICAGO
Offices in All Principal Cities in United States and Canada

Miscellany

National Safety Council Picks Contest Winners

Winners have been announced for the annual safety contest conducted by the National Safety Council. In the public utilities section, top 1950 awards went to the following companies:

Combination gas and electric: Group A—New Orleans Public Service Inc., first; Wisconsin Power & Light Co., Madison, second; Wisconsin Public Service Co., Milwaukee, third. Group B—Central Vermont Public Service Co., Rutland, first Worcester (Mass.) County Electric Co., second; Northwestern Public Service Co., Huron, S. D., third. Group C — five companies tied for first: Green Mountain Power Corp., Montpelier, Vt.; Suburban Gas & Electric Co., Revere, Mass.; Wachusett Electric Co., Leominster, Mass.; Beverly (Mass.) Gas & Electric Co.; and Athol (Mass.) Gas & Electric Co.

Gas companies: Group A—Columbia Gas System, Columbus Group, first; East Ohio Gas Co., Cleveland, second; Hope Natural Gas Co., Clarksburg, W. Va., third. Group B — Colorado Interstate Gas Co., Colorado Springs; Pittsburgh-West Virginia Gas Co., Pittsburgh; Nashville (Tenn.) Gas & Heating Co. Group C — Northampton (Mass.) Gas Light Co.; Water & Gas Dept., Duluth, Minn.; Salem (Mass.) Gas Light Co.

* * * *

Other safety records and plans were in the news, too. Panhandle Eastern Pipe Line Co., Kansas City, Mo., is proud of its 1950 automobile accident rate—the lowest in the past decade. Drivers of company vehicles drove 6,125,830 miles during the year with 32 accidents—191,432 miles per accident.

Philadelphia Electric Co.'s president, H. B. Bryans, presented "safe driver certificates" to employees who have driven 10 or more accident-free years. At a meeting of the employees association, 523 drivers, representing a total of 8790 accident-free years, received certificates. Five employees have maintained safe-driving records of 25 years—a total of about 1½ million miles.

In New York, the Brooklyn Union Gas Co. is starting a driving maintenance training course this month to promote safety among the firm's 900-odd licensed drivers of company vehicles. Object of the program is to develop proper attitude among employee-drivers and to provide facilities and tests whereby all employees may demonstrate their driving capabilities under simulated and actual traffic conditions.

Laclede Needs More Gas

No gas will be available for heating new residential housing or for conversion of furnaces in old housing before the 1951-52 heating season, Laclede Gas Co. recently told St. Louis residents.

Because of insufficient supply of natural, the utility has been rejecting applications for space heating gas since last October, but the limitation has not applied to new housing.

Laclede receives 268 MMcf daily from Mississippi River Fuel Corp. and supplies about 100,000 space heating customers.

Insuring Protection for Power Radio in War Urged

Protection of utilities' "power radio service" from being confiscated in time of emergency for general civilian defense use and the use of the now-restricted television band at such times are matters now of deepest concern to the National Committee for Utilities Radio.

At its annual meeting in Chicago in February, the committee adopted resolutions aimed at effecting these principles.

Adopting a policy that, in time of disaster, the first call on utilities radio shall be for purposes of restoring essential utility service, the committee in its resolution urged member companies to assure themselves that CD will not try to requisition this equipment.

The essentiality of maintaining inter-system communications, particularly in the event of wire service disruption, led to a resolution presented to FCC, seeking permission to utilize the 72-76 MC band in emergencies. Member companies are now barred from the use of this band under any conditions in locations where interference with television is likely.

Modification of the FCC rules covering the operation of mobile relay stations was also discussed. Since operation of a mobile radio station (which is one established to receive signals directed to it by a mobile station and to transmit them automatically on a mobile service frequency for reception by another such station) requires two frequencies, the committee has opposed modification of rules which would permit unrestricted use of this facility. This attitude was based upon a desire for channel conservation.

However, recognizing the need for such a facility in isolated cases, NCUR last year made recommendation to FCC regarding licensing of them. Last February FCC revised its rules more or less along the lines recommended, but the committee intends to carry on further study of the proposal.

High Court Voids Wisconsin Anti-Strike Law

Late in February the U.S. Supreme Court declared unconstitutional a Wisconsin law forbidding public utility strikes. The high court ruled, 6 to 3, that the state law is contrary to federal labor law.

Validity of anti-strike laws in other states —among them Kansas, New Jersey, Pennsylvania, and Nebraska — was thus thrown open to question.

Chief Justice Vinson declared in the majority decision that federal legislation covering all industries "affecting commerce" includes privately owned utilities operating within a single state. The dissenting justices contended that Congress did not intend to leave the states helpless in local situations.

Sendout Passes Billion Mark

For the first time, deliveries of natural gas to the Los Angeles area exceeded 1 billion cu ft on Feb. 26 when 1003 MMcf of gas surged through the integrated lines of Southern Counties and Southern California Gas Co.'s.

The record was not to stand long, however. On Feb. 27 sendout soared to 1004 MMcf, and on March 1 an all-time high of 1014 MMcf was recorded for the Los Angeles basin, with a total system sendout of 1150 MMcf.

Plenty of gas was available; even during peak demand, some interruptible customers were receiving small amounts.

Plastic Pipe Promises Relief in Steel Pinch

Faced with the problem of wartime shortages in steel pipe, Southern California Gas Co., Los Angeles, like many other members of the gas industry, began in 1942 to search for possible substitutes. The growing acceptance of plastic materials for various purposes in industry led to a series of preliminary investigations of this type of material in lieu of steel service pipe.

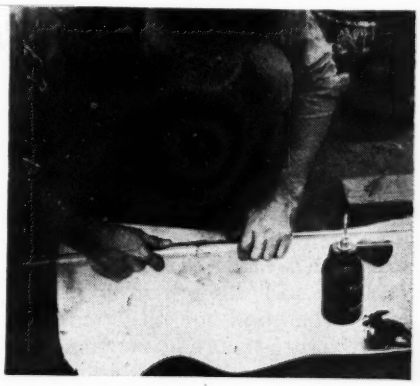
An improved plastic pipe supplied by Gordon Z. Greene Co., Los Angeles, and known as "Kraloy A" is being used by SoCal. Some of the advantages claimed for plastic are these:

1. Plastic tubing has longer life, because of freedom from corrosion.

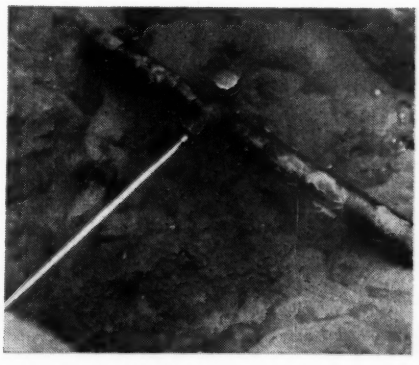
2. Plastic services are more easily field fabricated than are steel services. It has also been found that men can make the installations with very little training.

3. Plastic material is very light in weight, and the length required for an average service can be handled by one man.

4. Plastic system is a cathodic protection, resisting galvanic corrosion on the main and meter.



SOLVENT CEMENTED bell joint is made at the installation.



PLASTIC-TO-METAL connection using copper bushings and copper nipples for strengthening. Plastic bushings and nipples are now being substituted for the copper.

ASSOCIATIONS

This Month

Distribution Experts To Confer in Memphis

April is the big month for meetings in the gas industry, and topping them all in technical interest will be the Distribution, Motor Vehicles, and Corrosion Conference of the American Gas Assn. in Memphis, Tenn., April 16-18.

A. H. Cramer

In all of the three phases of the gas business, the program arranged by chairmen of the three sections promises to cover almost every major problem facing operating men. And as a special event, a general session on the final day's agenda will be devoted to the all-important problem of safety.

Changeovers to natural gas and the effects of house heating loads on a system are two principal topics on the program, proving that gasmen are still searching for solutions to some of the difficult problems which these two subjects pose. In the motor vehicles session, particular stress is being laid on two currently important aspects—the use of LP-Gas as a motor fuel and the relative advantages of fleet leasing arrangements.

In the field of corrosion, techniques and economics of installing protection all the way from the transmission line to the appliance will be discussed.

The three-way program was arranged under the joint chairmanship of V. F. Bittner, Peoples Gas Light & Coke Co., Chicago, chairman of the distribution committee; Paul W. Rogers, The Ohio Fuel Gas Co., Columbus, motor vehicles committee head; and A. H. Cramer, Michigan Consolidated Gas Co., Detroit, chairman of the corrosion committee.

Ways of Washington To be Studied by GAMA

The Washington scene and its relationship to the gas appliance and equipment industry will be the keynote of the two-day meeting of the Gas Appliance Manufacturers Assn., to be held at the Drake hotel in Chicago April 16 and 17.

F. O. Hess

The entire Tuesday morning general session will be a business conference devoted to speakers who are members of various governmental departments. Beardsley Ruml, nationally known economic advisor, will summarize and answer questions.

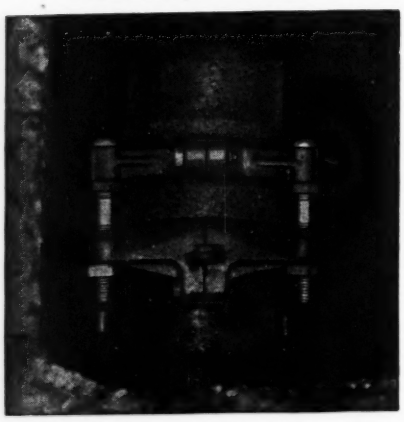
A SIMPLE SOLUTION for one of the GAS INDUSTRY'S *most trying problems*

the **NORMAC**

BELL JOINT CLAMP

SOLVES YOUR JOINT REPAIR PROBLEMS

6 inch Normac Clamp being lowered into hole for installation



6 inch Normac Clamp in service after installation

QUICK • EASY • PERMANENT

Installed in small pavement openings. Available in all standard sizes from 3" to 12". A simple set of tools cleans the joint, installs the clamp . . . often in only a quarter of an hour. SAVES TIME. SAVES MONEY and the repair is permanent. Designed for all conditions particularly where pavement repair costs are prohibitive. Such small opening repairs are scarcely noticeable when pavement is replaced.

Normac Clamps can be installed in large as well as small openings.

Norton - McMurray hold definite leadership in the development of methods for installation and rehabilitation work through small openings. We welcome the opportunity to help solve a problem you may have—tell us about it.

Write for our catalog describing our complete line of COUPLINGS . . . FITTINGS . . . SERVICE TEES and ELLS . . . SLEEVES . . . COMPRESSION-END COCKS . . . METER BARS and BRASS FITTINGS for copper pipe.

NORTON-McMURRAY MFG. CO.

39 SOUTH LA SALLE ST. • CHICAGO 3, ILL.

Method and product covered by U. S. Patents, Nos. 2,163,261 and 2,178,286.

The two-day meeting will include divisional sessions and two general session luncheons, one devoted to general GAMA business matters, and a second at which representatives of the American Gas Assn. will address the group.

Frederic O. Hess, president of GAMA, will preside at the general sessions. He will deliver the president's address and will officially present the 1951 Meritorious Service Awards to those who have made outstanding contributions to the industry in the past year.

Leland M. Feigel of Servel is serving as program chairman.

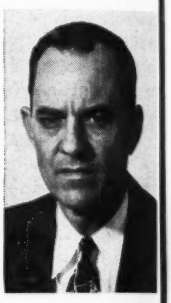
Southern Gas Convention Expected to Draw 1400

Southern Gas Assn. is expecting an attendance of 1400 for its 43rd annual convention to be held at Biloxi, Miss., April 23-25.

Such an enthusiastic turnout would smash all attendance records. Last year's count, the previous record, was 1153.

The three-day affair holds promise of ample rewards for delegates. Woven around two general sessions and two general luncheons will be work-level round tables and special meetings of the accounting section, distribution section, employee relations section, sales group, and transmission section. The last named, which held its first convention meeting last year, promises a particularly outstanding program, including discussions of microwave communication systems, off-shore pipelines, fluid knockouts, fluid removals, dispatching, orifice meter testing, gas turbines, mechanized operation, and many others.

Carl H. Horne



J. L. Campbell

Comparison of competitive equipment, thermostats, and servicing of commercial equipment are among topics to be covered in the commercial session of the sales section. Gas turbine generating units and conversion of diesels to dual-fuel operation are subjects scheduled for the industrial sales meeting. Automatic range ignition and the gas clothes dryer are but two of the subjects listed for the residential group.

Mechanization will be one of the principal items of interest at the distribution session, while employee development and governmental regulations are two choice selections for the employee relations and accounting conclaves.

Heading the list of impressive speakers will be Carl H. Horne of Alabama Gas Corp., Birmingham, incumbent SGA president. J. L. Campbell, New Orleans, is general convention committee chairman.

80 Subjects to be Taught At Measurement Course

At the University of Oklahoma, Norman, the 26th annual Southwestern Gas Measurement Short Course will go in session April 10-12. About 25 states and several foreign countries are expected to be represented.

W. H. Carson

Speakers at the opening day's general session will include W. H. Carson, dean of the school of engineering, and Dr. G. L. Cross president of the university, and M. A. Abernathy, vice president, United Gas Corp., Shreveport.

Subjects scheduled for the general session on the second day include: announcement of winners of 1950 prize papers awards and report of the committee for study of practical methods by Pat H. Miller, Texas Eastern Transmission Corp., Shreveport. At the final morning session Ben F. Worley, chairman, will introduce the general chairmen for 1952. Afternoons will be devoted to classes on more than 80 subjects.

AGA Calendar Heavy With April Conferences

Other conferences of top interest will vie for gasmen's attention this month.

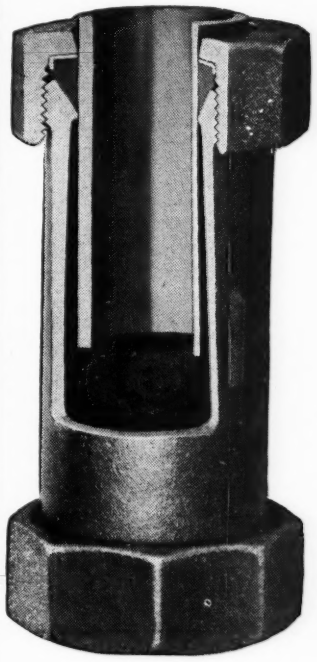
First on April's calendar is the AGA Sales Conference on Industrial and Commercial Gas, meeting April 2-4 at Washington's Shoreham hotel. Three other AGA affairs are also on tap — the Mid-West Regional Gas Sales Conference, the National Conference of Electric and Gas Utility Accountants, and the Pacific Coast Research and Utilization Conference.

Advance reservations indicate a turnout exceeding 500 for the Mid-West meeting, to be held at the Edgewater Beach hotel in Chicago April 9-11. Chairman J. E. Walsh of Metropolitan Utilities District, Omaha, Neb., has lined up D. A. Hulcy, AGA president, as a keynoter, and has selected top speakers to cover the competitive picture on gas ranges, the industry's coordinated promotional program for 1951, tested selling methods, and the gas clothes dryer.

The research conference will dovetail with the Customers Service Conference of the Pacific Coast Gas Assn., the two being held jointly at Berkeley, Calif., April 26 and 27. All phases of development and research under the PAR plan will be extensively reviewed. The Venting-Ignition-Combustion program of AGA will be thoroughly explored. Guy Corfield, Southern California Gas Co., will chairman the meeting.

The University of Tennessee's second annual Combustion Conference gets under way April 5 for a two-day run at the Knoxville campus. "Large Boiler Conversion to Natural Gas" and "Multiple Fuel Burning" are topics of particular interest to gasmen in attendance.

NORMAC
COUPLINGS, SLEEVES and FITTINGS

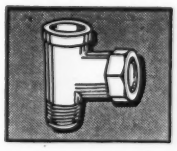


for maximum deflection, ease of "stabbing," complete confinement of the rubber!

So close are "Normac" rubbers confined at the gasket tip that possibility of flow is reduced almost to "nil." These couplings, sleeves and fittings . . . approved by gas utility men across the country for their time-saving features, ease of handling and dependable service . . . are available in a complete range of sizes. Made from air furnace malleable iron they provide greater wall thickness than pipe on which used.

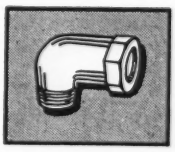
NORMAC COUPLINGS are made with 5" centers in all sizes. NORMAC SLEEVES are identical in design except that they are made with 10" centers. Nuts and gaskets are interchangeable.

COMPRESSION-END SERVICE "TEE"



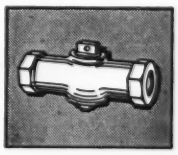
First fitting of this type ever produced with full coupling depth and special threads on male end to prevent dropping into old hand taps when used to replace standard threaded fittings.

COMPRESSION-END SERVICE "ELL"



Extra depth makes it possible to "stab" pipe into stops and without measuring, pull back a safe distance to allow ultimate deflection eliminating possibility of strain against tap in main.

COMPRESSION-END IRON BODY BRASS CORE SERVICE STOPCOCKS



End the necessity of threading on the job plus the elimination of the threads themselves — combining all the advantages of NORMAC COUPLINGS and the best in stopcock design. 2½" coupling depth on each end.

NORMAC BRASS FITTINGS DEVELOPED IN 1939 FOR USE WITH COPPER TUBING

Our complete line of brass fittings can be used either on new installations or where copper is run through old steel pipe in large or small openings. The center to end dimensions of NORMAC TEES correspond with old malleable iron fittings. This feature is extremely important in the use of these fittings in one foot openings where the tubing must line up with the steel which has been removed.

Write for the NORMAC CATALOG of Gas Distribution Equipment

NORTON-McMURRAY MFG. CO.

39 SOUTH LA SALLE ST. • CHICAGO 3, ILLINOIS

Couplings • Meter Bars • Sleeves • Cocks • Bell Joint Clamps • Service Tees & Ells

Last Month

Emphasis on Selling at Mid-West's Convention

The emphasis was all on selling at the 46th annual meeting and convention of the Mid-West Gas Assn. last month in Omaha, Neb. More than 400 delegates turned out for the show.

One of the feature attractions was the message of J. G. Dierkes, general manager of the incinerator division of Bowser Inc. Plus values of gas-fired incinerators were stressed in his talk.

"It can definitely be stated that the installation of an automatic gas fired incinerator in a chimney with other gas appliances is beneficial to the operation of the other appliances, because through daily use of the incinerator the chimney or flue is maintained in dried-out condition, free of air and vapor locks," he declared.

Larry Shomaker

J. F. Donnelly

With reference to local codes governing such installations, Mr. Dierkes felt that much work needs to be done to banish regulations which are limiting sales of incinerators.

The superiority of gas incinerators over garbage disposal units can be demonstrated by a look at fire loss statistics, he said. Rubbish, which disposal units will not handle, caused 30,000 fires in 1949 accounting for a $6 million loss.

The theme of the meeting, selling by gas company door - to - door salesmen, was keynoted by W. L. Hayes of Montana-Dakota Utilities Co., Minneapolis.

Among many outstanding speakers on the program were AGA President D. A. Hulcy, C. M. Dunn of Estate Stove, J. F. Donnelly of A. O. Smith Corp., Frank T. Carpenter of United Petroleum Gas Co. in Minneapolis, and H. D. Valentine of Peoples Gas Light, Chicago.

Officers elected included Larry Shomaker, Northern Natural, Omaha, president, succeeding D. J. Reimers, Minnesota Valley Natural Gas Co., St. Peter, Minn.; Amos H. Abott, Northern States Power Co., Minneapolis, first vice president; E. E. Baxter, Central Electric & Gas Co., Lincoln, Neb., second vice president; and Harold E. Peckham, Northern States Power, who succeeded himself as secretary.

* * * * *

On the Pacific Coast, two recent meetings of regional groups attracted large gatherings.

At Loma Linda, Calif., the Santa Cruz-Watsonville unit of the Gas & Electric Dealers Assn. acted as hosts to members of nearby units at a meeting featuring a talk by Joe Connelly, district manager for Servel Inc. Mr. Connelly told the group that all-out production would be in order barring critical cuts in materials availability.

At the annual meeting of the Gas Appliance Society of California in San Francisco, S. W. Newman of Charles Brown & Sons, San Francisco, was re-elected president for 1951. Other officers re - elected for the coming year were Jim Graham, James Graham Manufacturing Co., vice president; O. R. Doerr, Pacific Gas & Electric Co., secretary; George W. Baldwin, Geo. D. Roper Corp., treasurer, and Walter E. Lind, PG&E, chairman of the executive committee.

* * * * *

N. E. Berry of Servel is the new president of the National Assn. of Corrosion Engineers, following elections held by the association at its 7th annual conference and exhibition held March 13-15 at the Statler hotel, New York.

Mr. Berry, formerly vice president, succeeds Vance N. Jenkins of Union Oil Co. of California, Wilmington, and is in turn succeeded by Mars G. Fontana, Ohio State University.

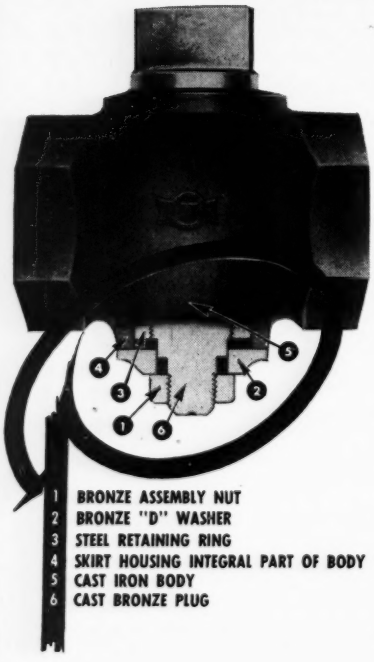
R. A. Brannon, Humble Pipe Line, Houston, continues as treasurer and A. B. Campbell was named again as executive secretary.

A record-breaking turnout of 1200, 200 more than last year's show attracted, visited nearly 100 exhibits and heard round table discussions on cathodic protection, oil and gas industry subjects, pipeline and underground corrosion, as well as other discussions in allied fields.

HAYS®

TAMPER-PROOF GAS STOPS

FEATURES


1 BRONZE ASSEMBLY NUT
2 BRONZE "D" WASHER
3 STEEL RETAINING RING
4 SKIRT HOUSING INTEGRAL PART OF BODY
5 CAST IRON BODY
6 CAST BRONZE PLUG

- Tamper-Proof Design with Non-Removable Plug.
- Extra Grade Gray Iron Body, Gas Service Bronze Plug.
- Steel Retaining Ring Prevents Removal of Plug.
- Steel Retaining Ring Assembled to Bottom of Plug—Eliminates Possible Damage to Precision Ground Surface of Plug and Body.
- Steel Retaining Ring Threaded and Staked to the Largest Metal Diameter on Bottom of Tapered Plug—Assures Retention without Distortion.
- Steel Retaining Ring Anchored without Drill Hole or Pin—Eliminates Possible Shearing of Plug.
- Steel Retaining Ring Located below Shoulder of Body—Permits Freedom for Service Adjustment of Plug.
- Steel Retaining Ring Recessed and Inaccessible within Iron Body—Gripless and Shearless.
- Plug and Body Precision Ground and Matched for Perfect Seating.
- Individually Tested Under Rigidly Controlled Inspection.
- Lubricated with a Compound of Greases Suitable for Use with Manufactured, Natural or Liquid Petroleum Gases.
- Obtainable in a Variety of Patterns.

Write for Folder 120-C D

AVAILABLE IN

Black or Galvanized

Flat Head Less Check
Flat Head With Check
Flat Head With Lock-Wing

Sizes; ¾"—1"—1¼"—1½"—2"

Also HAYS STANDARD
HEAVY PATTERN IRON BODY
GAS STOP

For 75 Years the Gas Industry has relied on HAYS Iron Body Gas Stops

Not 1 but 5 GAS ODORANTS

all service proved to do the best job under any condition

Long experience in providing gas odorants to the natural gas industry has shown that no single gas odorant can be the perfect answer to every odorizing need. That's why Oronite, a pioneer in the field, offers five gas odorants—time tested to do the best job under any operating or service condition. There's no need to fit your equipment to the odorant—Oronite can supply the odorant to fit your exact requirements.

ORONITE ALERT

ORONITE CHEMICAL COMPANY

THE NAME TO WATCH IN CHEMICALS ®

② Calodorant "C"

Built to Gas Engineers' specifications, this superior gas odorant is completely stable and highly resistant to adsorption or oxidation. It contributes the least amount of sulfur, has a high thermal decomposition point (900° F.), exceptional stability and a distinctive odor. Calodorant "C" gives adequate odorization at ½ pound per MMCF of gas.

③ Calodorant "C" Special

Has essentially the same characteristics as Calodorant "C" except that it has been compounded so that it can be used at 1 pound per MMCF. This facilitates its use through odorizers which cannot be accurately adjusted to a ½ pound rate.

④ Calodorant Gas Odorant

The first and most widely used gas odorant in the gas industry, Calodorant is of a cyclic sulfide type. Produces an intense true "gassy" odor, is low in cost and easy to use. Two gallons per MMCF of gas provides adequate protection.

⑤ LP-Gas Odorant

Made especially for LP-Gas but works as well in natural gas. It is ideally suited where conditions dictate a narrow boiling range mercaptan type odorant.

ORONITE CHEMICAL COMPANY

38 SANSOME ST., SAN FRANCISCO 4, CALIF. — STANDARD OIL BLDG., LOS ANGELES 15, CALIF.

30 ROCKEFELLER PLAZA, NEW YORK 20, N.Y. — 600 S. MICHIGAN AVENUE, CHICAGO 5, ILL.

824 WHITNEY BLDG., NEW ORLEANS 12, LA.

CALENDAR

APRIL

AGA Sales Conference on Industrial & Commercial Gas — Shoreham hotel, Washington, D.C., April 2-4.

Mid-West Regional Gas Sales Conference, Residential Gas Section—Edgewater Beach hotel, Chicago, April 9-11.

Southwestern Gas Measurement Short Course—University of Oklahoma, Norman, April 10-12.

AGA Distribution, Motor Vehicle, and Corrosion Conference—Hotel Peabody, Memphis, April 16-18.

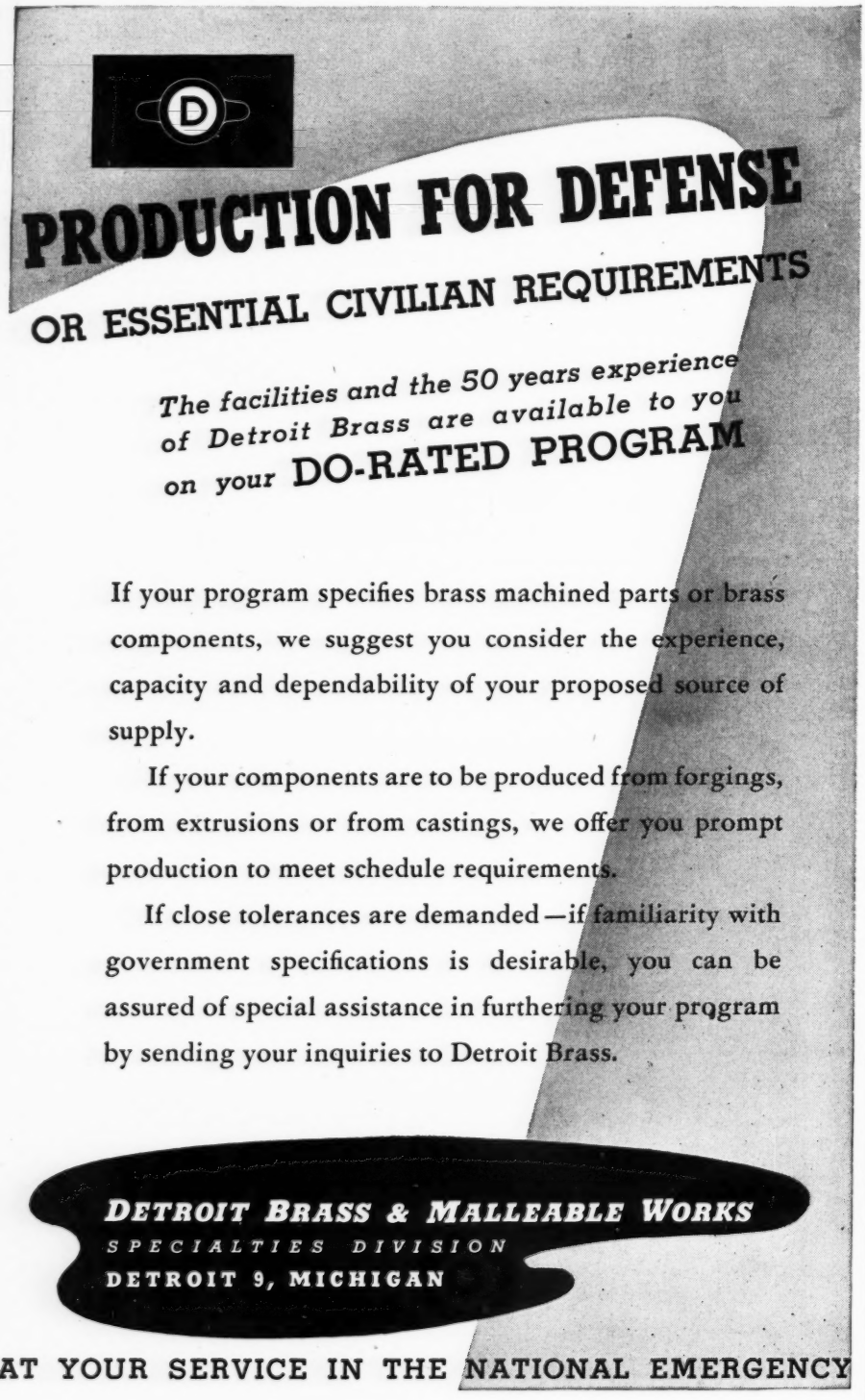
Gas Appliance Manufacturers Assn. Annual Meeting—The Drake hotel, Chicago, April 16-18.

Florida - Georgia Gas Assn. Spring Convention — Hollywood Beach hotel, Hollywood Beach, Fla., April 19-21.

Southern Gas Assn. Annual Meeting —Biloxi, April 23-25.

National Conference of Electric and Gas Utility Accountants—Hotel Sherman, Chicago, April 23-25.

Pacific Coast Research & Utilization Conference—Berkeley, Calif., April 26-27.


PRODUCTION FOR DEFENSE
OR ESSENTIAL CIVILIAN REQUIREMENTS
The facilities and the 50 years experience of Detroit Brass are available to you on your DO-RATED PROGRAM
If your program specifies brass machined parts or brass components, we suggest you consider the experience, capacity and dependability of your proposed source of supply.
If your components are to be produced from forgings, from extrusions or from castings, we offer you prompt production to meet schedule requirements.
If close tolerances are demanded—if familiarity with government specifications is desirable, you can be assured of special assistance in furthering your program by sending your inquiries to Detroit Brass.
DETROIT BRASS & MALLEABLE WORKS
SPECIALTIES DIVISION
DETROIT 9, MICHIGAN
AT YOUR SERVICE IN THE NATIONAL EMERGENCY

Indiana Gas Assn. — French Lick Springs, French Lick, Ind., April 26-27.

Interstate Oil Compact Commission —La Fonda hotel, Santa Fe, N. M., April 26-28.

MAY

New Jersey Utilities Assn. Spring Meeting—Seaview Country Club, Absecon, N.J., May 4.

AGA Natural Gas Department Spring Meeting—Baker hotel, Dallas, May 7-8.

Missouri Assn. of Public Utilities—Jefferson hotel, St. Louis, May 7-9.

National Resturant Exposition—Navy Pier, Chicago, May 7-11.

AGA Production and Chemical Conference—Hotel New Yorker, New York, May 14-16.

AGA Industrial and Commercial Gas Section Industrial Gas School—William Penn hotel, Pittsburgh, May 14-18.

Pennsylvania Gas Assn.—Wernersville, Pa., May 15-17.

Public Utilities Advertising Assn. Convention—Hotel New Yorker, New York, May 17-19.

AGA Domestic Gas Research & Utilization Conference—Hotel Statler, Cleveland, Ohio, May 24-25.

American Society of Refrigeration Engineers Spring Meeting—Hotel Statler, Detroit, May 27-30.

Natural Gas & Petroleum Assn. of Canada—Royal Connaught hotel, Hamilton, Ont., May 31-June 1.

JUNE

Institute of Cooking and Heating Appliance Manufacturers Annual Meeting—Cincinnati, June 5-6.

AGA Executive Conference—Greenbrier hotel, White Sulphur Springs, W. Va., June 11-12.

Canadian Gas Assn.—Bigwin Inn, Lake of Bays, Ontario, Canada, June 18-21.

New York-New Jersey Regional Gas Sales Conference, Residential Gas Section—Spring Lake Beach, N. J., June 19-20.

Michigan Gas Assn.—Grand hotel, Mackinac Island, Mich., June 25-26.

SEPTEMBER

Pacific Coast Gas Assn. Annual Convention — Fairmont hotel, San Francisco, Sept. 4-6.

OCTOBER

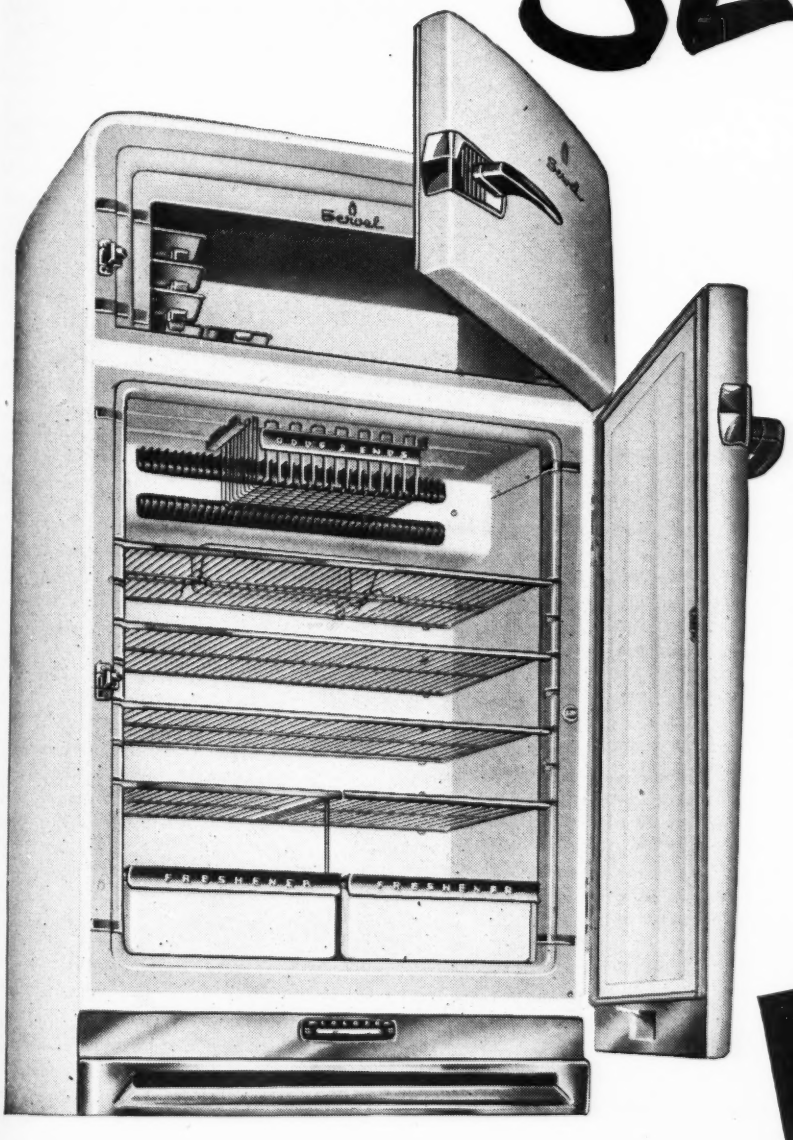
Texas Mid - Continent Oil & Gas Assn. Annual Meeting — Beaumont, Texas, Oct. 8-9.

39th National Safety Congress & Exposition of the National Safety Council—Chicago, Oct. 8-12.

AGA Annual Convention—St. Louis, Oct. 15-17.

National Metal Congress and Exposition—Detroit, Oct. 15-19.

Everywhere, Customers Are Enthusiastic about the NEW SERVEL



ROYAL TUDOR. (Model BR-1118)—Volume 11.5 cu. ft. New-design cabinet with Newtone exterior. 2 Dew-Action Vegetable Fresheners. "Odds and Ends" Basket. 5 Quick-Release Ice-Cube Trays. Full-Width evaporator with exterior door.

WHEN you put this marvelous new Servel on display, just stand back and watch the reaction. It's the sensational Royal Tudor, and nothing else can compare with it.

Customers will marvel at the engineering change that has made it, and all the new Servels, bigger inside . . . smaller outside. They'll admire the handsome, classic styling—certain to enhance any kitchen. They can't help but be impressed by all the Royal's luxurious conveniences . . . from its massive, full-width evaporator to its twin Dew-Action Vegetable Fresheners.

And, of course, every customer will know about Servel's famous motorless freezing system. The "no moving parts" system that means years of silent, dependable service. So stock the Royal Tudor, and all seven other great new Servels. Show them . . . and watch your customers buy them.

For full details write to Servel, Inc., Dept. I-14, Evansville 20, Ind.

STAYS SILENT . . . LASTS LONGER

Servel

The GAS Refrigerator

TRADE LITERATURE

GENERAL CONTROLS, CO., 801 Allen Ave., Glendale 1, Calif.—A new 56-page handbook has been issued to provide in non-technical terms an explanation of how the firm's B-60 gas control system operates. Complete information on operation, maintenance, and test procedures is included. Available upon request, the book is designated Bulletin 605.129.

MINNEAPOLIS-HONEYWELL REGULATOR CO., Brown Instruments Division, Wayne and Windrim Aves., Philadelphia 44—Acceleration of research through the use of industrial and related instruments and apparatus is the subject of an 8½ x 11, 84-page book which will serve as a reference and application guide for researchers and analysts. The book covers devices made by many organizations and used in combination with Minneapolis - Honeywell instruments. Sections are titled Analytical Apparatus, Precision Laboratory Measuring Instruments, and Research Apparatus Components.

CLARK BROS. CO., INC., Olean, N. Y.—Bulletin 104 describes Clark Model HBA super 2-cycle, right angle, high compression, gas engine driven compressor units. The company also has issued two pieces of technical literature—"Natural Gas Scrubbers and Mist Extractors" by Thomas H. Pofahl (Bulletin 108), and "Compressor Cylinder Design for Gas Transmission Pipeline Systems" by B. T. Mast (Bulletin 109).

REMINGTON RAND INC., 315 Fourth Ave., New York 10—Three new publications have been issued. Bulletin TM-758, titled "A New Way to Produce Financial Statements," tells a step-by-step story of how punched card accounting systems provide management data. "Figure-Fact Atomic Age Accounting at Machine Speed With Machine Accuracy" is the name of a folder dealing with three major functions: recording, sorting and arranging, and reporting. The company's Kolect-A-Matic equipment is the subject of a 28-page catalog called "The Simplified Unit Invoice Accounting Plan."

SURFACE COMBUSTION CORP., Toledo 1, Ohio—*The Humidity Engineer* is a new periodical which will present current technical and operating information on Kathabar humidity control equipment. Air conditioning or process engineers and plant maintenance men will be added to the mailing list upon written request. The company also has issued Bulletin SC-150, " 'Surface' Heating and Heat Treating Furnaces for Defense Production."

CASEY & CASE COATING CO., P. O. Box 151, Maywood, Calif.—A well illustrated bulletin on vinyl plastic coatings for corrosion control on the exteriors of steel, concrete, brick, formed block and plywood structures, and for use as a tank lining will be sent to interested users upon request. Specific properties are given, a chemical resistance chart is included, and methods of application are outlined.

THE BRISTOL CO., Waterbury 20, Conn.—Bulletin DM029 presents information on the company's Metameter telemetering instruments for remote recording, indicating, and automatic control of variables. A number of typical installations are illustrated and described.

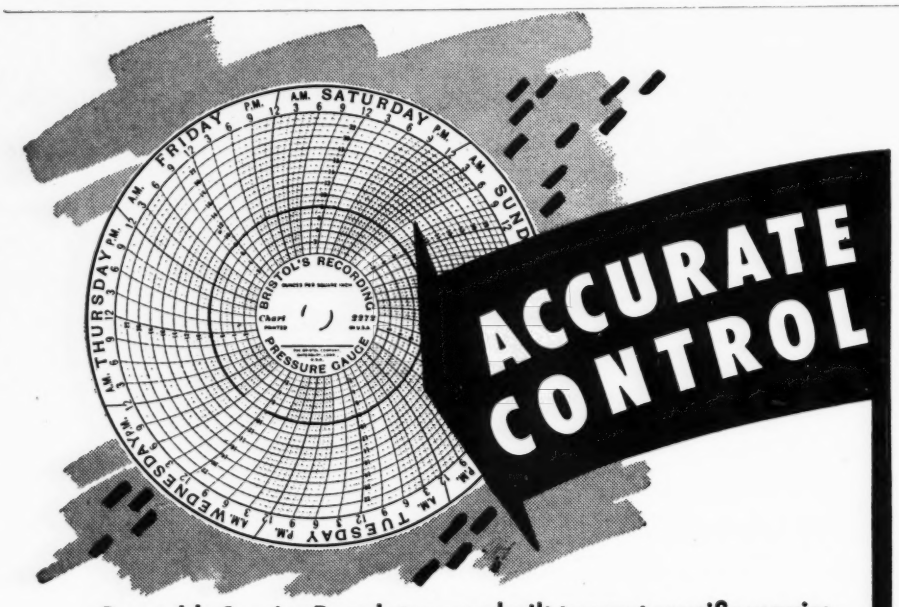
TROJAN MANUFACTURING CO., 1112 Race Dr., Troy, Ohio—A new data sheet describes and illustrates the Model B Trojan pipe puller and pusher which will push or pull ¾-, 1-, 1¼-, 1½-, and 2-in. pipe without additional dogs, clamps, or wedges. Complete specifications are included.

WHEELCO INSTRUMENTS CO., 847 W. Harrison St., Chicago 7—Bulletin C2-2 describes the firm's Capacilog line of electronically operated strip chart recorders. Copies of the bulletin and a supplementary price list are available upon request.

AMERICAN CAR & FOUNDRY CO., 30 Church St., New York 8—Bulletin 50-1 is a 14-page discussion of welded pressure vessels, complete with photographs, diagrams, and specification tables.

THATCHER FURNACE CO., Garwood, N. J.—In commemoration of a century of operation, this company has prepared a history titled "The First 100 Years of Thatcher Furnace Co."

BARBER-GREENE CO., Aurora, Ill.—An 8-page, two-color folder describes the Model 705-A Runabout ditcher with exclusive "Hydra-Crowd" hydraulic transmission.



Reynolds Service Regulators are built to meet specific requirements—years of operation in the field through a complete range of operating conditions have proved not only their superiority but their durability. With parts so precisely machined for each model that they are completely interchangeable. The accuracy you require in performance is assured.

MODEL 10

Dead Weight or Spring Type, with or without Mercury Seal, or Dead Weight Safety Seal or diaphragm operated relief valve. All working parts are so accessible as to be interchangeable without removal from pipe line.

MODEL 20

Dead Weight or Spring Type, with or without Mercury Seal, or Dead Weight Safety Seal or diaphragm operated relief valve. All working parts are so accurate as to permit complete interchangeability in shop.

MODEL 30

For horizontal or vertical connections, with or without removable valve pocket. Available with either Spring or Dead Weight adjustment. With or without Mercury or Dead Weight Safety Seal or diaphragm operated relief valve.

Reynolds Gas Regulator Co.
ANDERSON, INDIANA, U. S. A.
GAS CONTROL SINCE 1892

REALLY TAMPER PROOF

The Patented Tamper-Proof Feature on the Mueller H-11116 and the H-11118 Iron Body, Bronze Key, Straight Way, Gas Stops

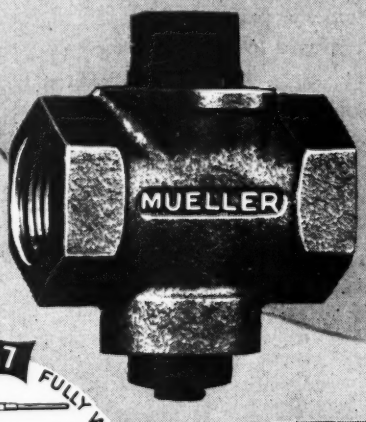
H-11118
The Lock Wing
Iron Body
Bronze Key
Gas Stop
Sizes
¾" 1" 1¼"

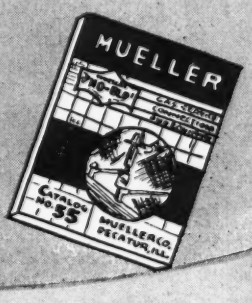
These Stops have a tamper-proof feature that makes them immune to dangerous operation by unauthorized persons. Even though the key nut is removed or the stem twisted off, the key will not blow out and the Stop will remain pressure tight.

The drive lock pin is driven through the key stem and retaining ferrule AFTER complete assembly and testing to insure that the Stop will hold pressure either with or without the key nut in place.

Available with Plain Flat Head or with Lock Wing and tested for 125 pounds pressure. Galvanized or Black finish.

H-11116
The Plain Flat Head
Iron Body
Bronze Key
Gas Stop
Sizes ¾" 1"
1¼" 1½" 2"





Write for Catalog No. 55

DEPENDABLE SINCE 1857 FULLY WARRANTED
OUR 93rd YEAR

MUELLER CO.

MAIN OFFICE AND FACTORY ..... DECATUR, ILLINOIS
OTHER FACTORIES: *Los Angeles, Cal.; Chattanooga, Tenn.; Sarnia, Ont. Canada*

CURRENT READING

AMERICAN STANDARD INSTALLATION of Gas Piping and Gas Appliances in Buildings—Approved by the National Fire Protection Assn. and the American Gas Assn., this text is a complete revision of the former "AGA Requirements and Recommended Practices for House Piping and Appliance Installation." The new standard applies to piping systems in buildings for low-pressure gas, not exceeding .5 psi. The pocket size text is available from the AGA Laboratories for 25 cents.

VENTING OF GAS APPLIANCES—Published by William Wallace Co., Belmont, Calif. Prepared under the supervision of C. E. Blome, Metalbestos Midwest division manager, from research material and field data collected from universities, independent laboratories, appliance manufacturers, and utility companies, the book presents specific recommendations for venting. It should be of interest to all who install, maintain, and operate gas appliances.

NEW PRODUCTS AND SERVICES—Published by the New York *Journal of Commerce,* 63 Park Row, New York 15, this 1951 edition presents a compilation of more than 1000 products recently marketed by 750 manufacturers in 50 different industries. The book is thoroughly cross-indexed. Price: 50 cents.

REPORT PREPARATION—by Frank Kerekes, assistant dean of engineering, and Robley Winfrey, professor of civil engineering at Iowa State College. Published by Iowa State College Press, Ames, Iowa. More than half a century of teaching and professional experience has gone into the writing of this 450-page book, prepared to train engineers in writing scientific papers and reports. More than 100 specimens of actual blueprints, photostatic copies, graphs, letters, and other demonstration material are included. Special sections deal with oral reports, magazine feature articles, correspondence, use of illustrations, etc. Price: $6.90.

Summaries of papers delivered at the Jan. 22-25 meeting of the American Society of Heating & Ventilating Engineers in Philadelphia are presented in the following items.

FACTORS USEFUL IN GROUND GRID DESIGN FOR HEAT PUMPS—by George S. Smith.

Some successes, but perhaps more failures have resulted in attempting to use a ground grid as a heat source for the heat pump. This study has attempted to supply some of the information most necessary in ground grid design and suggest methods of determining other necessary factors.

One important conclusion reached was the fact that except in very unusual cases, the average city lot will not supply the heat necessary to heat the house usually built thereon. However, a properly designed ground grid should prove to be a heat source excelled only by a well or spring.

USE OF AIRCRAFT PROPELLERS FOR AXIAL FLOW FANS—by Elmer C. Lindquist.

Scale models of aircraft propellers having two, three and four blades were installed in ducts and tested for performance as axial flow fans. Data obtained and presented in dimensionless form, and equations developed, are useful in selecting fans for a required performance.

Performance of a fan of any size may be predicted by the method given if information is available for any geometrically similar fan.

SOLAR ENERGY TRANSMITTANCE OF FIGURED ROLLED GLASS — by George V. Parmelee.

Solar energy transmittance data have been presented for seven patterns of figured glass. These data are of practical use in calculating solar heat gain and will be used in the preparation of design heat flow data.

It was found that even simple patterns greatly reduced transmittance, particularly at the higher angles of incidence, as compared to polished sheets of similar composition. Etching for reducing glare further reduces transmittance.

ROOF SPRAY FOR REDUCTION IN TRANSMITTED SOLAR RADIATION—by G. E. Sutton.

The effectiveness of roof sprays as a means of limiting surface temperatures of roofs exposed to solar radiation is shown by results of experiments in which adjustable two-nozzle rotating type roof sprays were operated under control of a temperature bulb placed 5/8 in. below the roof surface.

Tests proved that the surface temperature

Consolidated
TITRILOG

ACCURATELY RECORDS THE ODOR LEVEL OF NATURAL GAS

Model 26-102

SPECIFICATIONS

Furnished complete in floor mounted cabinet 22½" x 18½" x 66". Operates on standard 60-cycle, 115-volt power—requires approximately 6 amperes.

Gas companies, faced with the need for safe and economical distribution, recognize the importance of odorizing gas to a known and fixed level. The new Model 26-102 Consolidated Titrilog offers an effective and economical method of measuring and controlling this odorization.

The Consolidated Titrilog provides a continuous record of the exact concentration of odorant in the gas stream. With this record the maintenance of a constant odor level becomes a simple matter. In addition, the Titrilog's strip chart becomes a permanent record of effective odorization should evidence be required.

Sulfur compounds, such as H_2S, SO_2, mercaptans, thioethers, thiophene and organic disulfides, are recorded quantitatively in concentrations as low as 0.1 ppm or 0.005 grains per 100 cu. ft. Compounds of specific interest may be separately determined over a wide range of concentrations.

The Consolidated Titrilog may also be used in applications such as corrosion in lines and appliances, sour gas treating, and others.

Write today for the fact-filled booklet on the Consolidated Titrilog. Ask for Bulletin CEC-1810-X21

CONSOLIDATED ENGINEERING
Corporation

Analytical Instruments
300 N. Sierra Madre Villa

CEC

for Science and Industry
Pasadena 8, California

of a roof which would reach 150° F under maximum solar intensity if unsprayed, could readily be maintained at 100° F when sprayed. By comparison, 2-in. and 6-in. pools of water on the roof would maintain surface temperatures of 108° and 103°F, respectively.

An equation for instantaneous heat flow through roofs is developed. Advantages of the spray system are given.

FIELD STUDIES OF HEAT LOSSES FROM CONCRETE FLOOR PANELS — by C. M. Humphreys.

During the summer of 1949, thermocouples and heat flow meters were installed under four houses to study the heat losses from floor panels to the earth. Different kinds and amounts of insulation were placed under the floor slabs. The results of the tests in these four houses during the 1949-50 heating season are reported, and some details of instrumentation are given.

WATER-VAPOR PERMEABILITY OF BUILDING PAPERS AND OTHER SHEET MATERIALS — by E. R. Bell, M. G. Seidl, and N. T. Krueger.

The water vapor permeability of 100 building papers and other sheet materials was determined according to Tentative Standard Procedure C214-47T prepared by Committee C-16 of the American Society for Testing Materials. Both the dry and wet methods were used. Generally, the wet method yields values somewhat higher than those found by the dry method under the same conditions of temperature, air velocity, and vapor pressure difference through the samples, but the ratio between them was not even approximately constant.

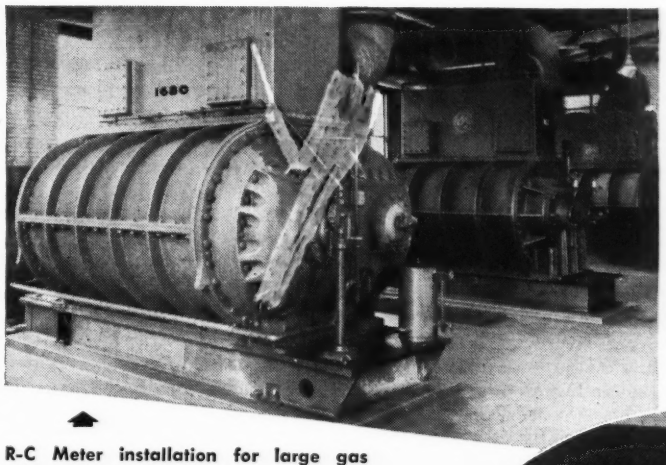
The test chamber was equipped with a sensitive thermostat and wood-element hygrostat that held both dry and wet bulb temperatures within very small variations. Pans were weighed in an enclosure in the chamber to maintain test chamber conditions during weighing and to exclude air currents. Deviations from the ASTM Tentative Standard Procedure C214-47T in regard to materials, methods, and techniques and the resulting advantages are explained.

A special method of sealing specimens over wet pans was developed and is described. The very large range of permeability values presented in the tables indicates that the tests included materials of both very low and very high permeability. They also indicate the magnitude of variations between different samples of the same material.

LOSSES FROM A FLOOR-TYPE PANEL HEATING SYSTEM — by F. W. Hutchinson, D. L. Mills, and L. J. La Tart.

This paper presents the results of an investigation on heat losses from two floor-type panel heating systems during the 1948-49 and 1949-50 heating seasons. Edge and rear losses were of the order of 30% of the total energy supplied so it may be concluded that insulation is necessary with floor-type systems if economical operation is desired.

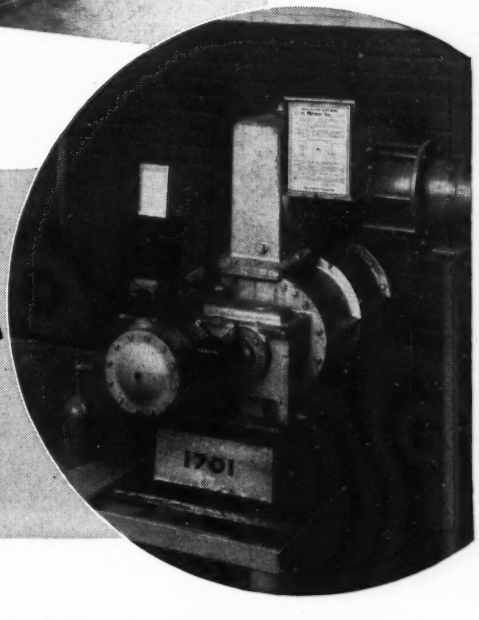
In addition to the loss data, experimental results are also presented giving the actual rating of a unit area of floor panel and the combined film coefficient of heat transfer for such a panel as evaluated from tests on the actual system; the latter results are of particular interest in that they permit conclusive decision as to the applicability of the laboratory tests of other investigators to actual field installations.



Typical R-C Meter in large industrial plant, used for measuring gas purchased from public utility. Capacity 33,000 cfh.

R-C Meter installation for large gas utility. Unit in foreground has capacity of 1,000,000 cfh. The two R-C Meters in background have been operating for many years.

YOU CAN ALWAYS trust R-C METERS



Continued repeat orders for R-C Positive Displacement Meters indicate the complete confidenee of public utilities in the unvarying reliability of these units. Many have been installed so long that the original dates have been forgotten—yet they continue to measure as dependably as the day they were first put into service. That is because:

1. **Accuracy is not affected by variations in specific gravity, rate of flow, pulsation, moisture, impurities or uncontrollable factors.**
2. **Accuracy is not subject to adjustment of meter or recorder by operators or other persons.**
3. **Accuracy is not affected by reasonable overloads.**
4. **Accuracy is permanent because measuring chambers are surrounded by precision-machined, cast-iron surfaces.**

Compactness of R-C Meters permits installation in cramped spaces. Sizes from 4,000 cfh to 1,000,000 cfh provide a wide range for public utility and industrial applications. Indicating and recording devices are available. Ask for details in Bulletin 40-B-14 or write us about your needs.

ROOTS-CONNERSVILLE BLOWER CORPORATION
510 Oregon Avenue, Connersville, Indiana

ROOTS-CONNERSVILLE
BLOWER BUILDERS SINCE 1854
ONE OF THE DRESSER INDUSTRIES

PEOPLE

New manager of Equitable Gas Co.'s (Pittsburgh) land and real estate department is J. M. SHIELDS, who has been the firm's land agent since 1937. JAMES A. FLINN has been appointed real estate agent for Mr. Shields' department.

On March 1, F. E. RICE, a pioneer in the natural gasoline industry, retired as vice president, director, and member of the executive committee of Phillips Petroleum Co., Bartlesville, Okla. In 1918 Mr. Rice designed a plant at Pershing, Okla., which established the oil absorption process for extracting natural gasoline from natural gas. He won the NGAA Hanlon award in 1949.

HARRY L. BROCIUS has been named acting local manager of The Manufacturers Light & Heat Co., Pittsburgh, and will take over the responsibilities of S. QUAY KING, who has been granted a leave of absence. Mr. Brocius has been district foreman for Manufacturers in the Bradford-Warren Pa., district and for The Keystone Gas Co. Inc., an associated company, at Olean, N. Y.

Retirement of HORACE J. SMITH, former owner and president of Ward Heater Co., Los Angeles, has been announced by CECIL M. DUNN, who heads the Ward operation since its purchase last month by Estate Stove Co., Hamilton, Ohio. Mr. Dunn is vice president and general manager of Estate. Mr. Smith will be available for consultation.

Russell Jarrett

C. M. Dunn

DICK MONTRIEF, vice president of Ward, will continue in that capacity and will have complete charge of manufacturing activities. RUSSELL JARRETT, formerly Estate western regional manager in the San Francisco area, is now vice president in charge of sales for the combined Los Angeles operation.

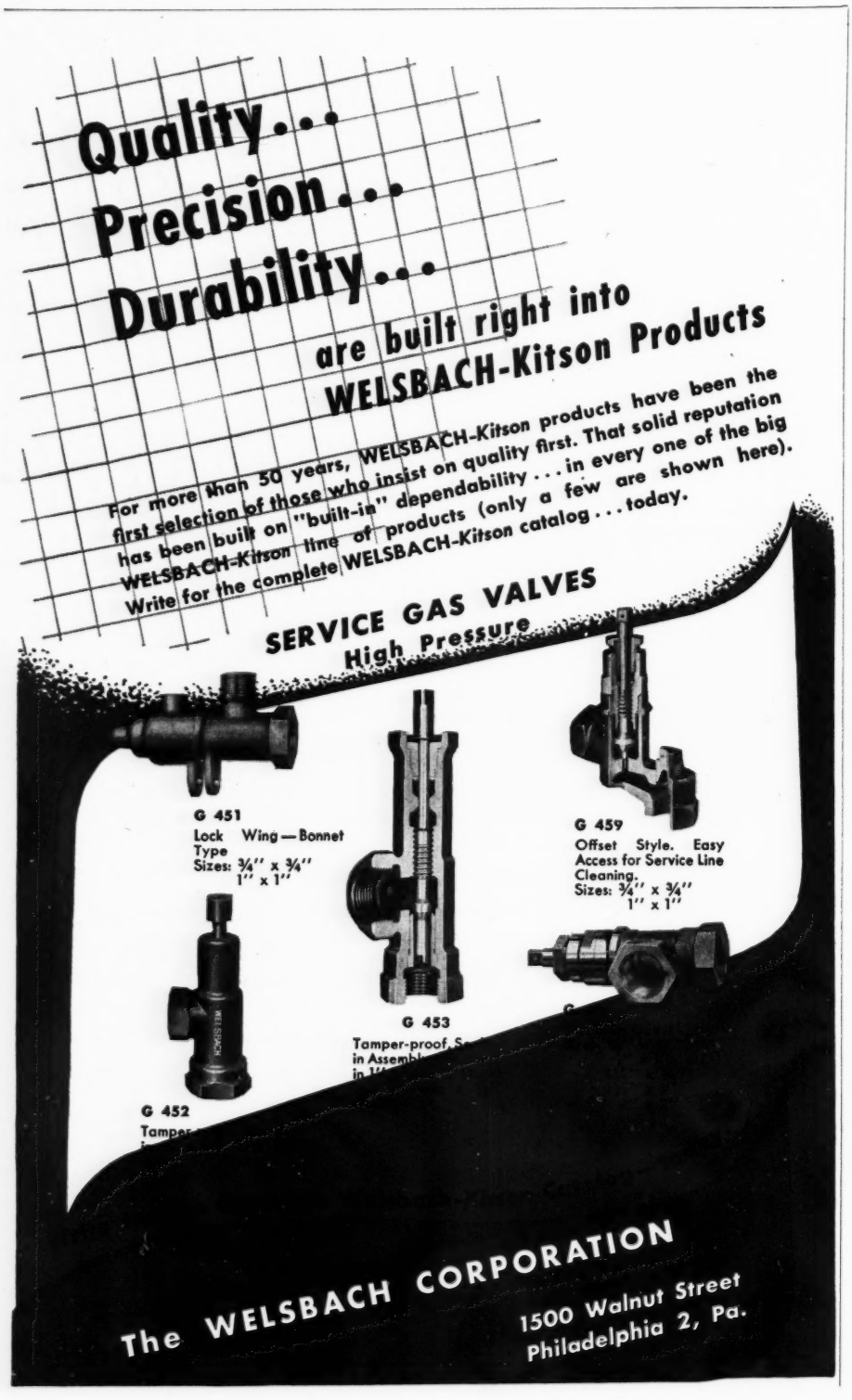
New manager of American Meter Co.'s Los Angeles factory is GEORGE W. STEVENSON. He joined the San Francisco branch of the company in 1928, was transferred to the Los Angeles office as sales engineer in 1936, and was later appointed assistant manager in Los Angeles.

G. W. Stevenson
... American Meter

D. L. Jerman
... Rockwell

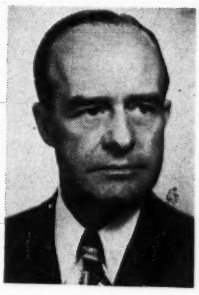
Among recent personnel changes announced by Rockwell Manufacturing Co., Pittsburgh, was the appointment of D. L. JERMAN as district supervisor of gas products and Nordstrom valves. Mr. Jerman joined the company as a sales engineer in 1937. PAUL A. WICK, assistant secretary of the firm since 1948, has been named assistant to the president. Election of MUNRO CORBIN as controller and I. C. ROWE as secretary also was announced.

OSCAR C. SATTINGER, who formerly handled legal matters for Southern Counties Gas Co., Los Angeles, has been retained as legal counsel by Pacific Lighting Gas Supply Co., an affiliate. In his new capacity, Mr. Sattinger will devote part of his time to general private practice. His duties at Southern Counties were taken over by Milford Springer on Feb. 1.

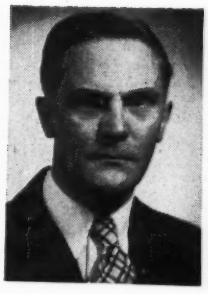

Quality...
Precision...
Durability...
are built right into
WELSBACH-Kitson Products
For more than 50 years, WELSBACH-Kitson products have been the first selection of those who insist on quality first. That solid reputation has been built on "built-in" dependability ... in every one of the big WELSBACH-Kitson line of products (only a few are shown here). Write for the complete WELSBACH-Kitson catalog ... today.
SERVICE GAS VALVES
High Pressure
G 451
Lock Wing — Bonnet Type
Sizes: ¾" x ¾"
1" x 1"
G 459
Offset Style. Easy Access for Service Line Cleaning.
Sizes: ¾" x ¾"
1" x 1"
G 453
G 452
The WELSBACH CORPORATION
1500 Walnut Street
Philadelphia 2, Pa.

J. C. Donnell II

W. T. Nightingale



L. C. Olpin



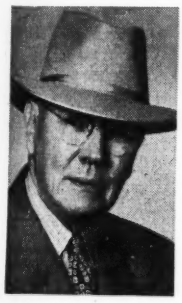
L. C. Peschel

C. T. Woodroof

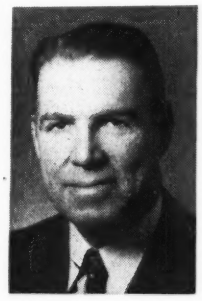
At a February meeting of the Mountain Fuel Supply Co. board of directors, J. C. DONNELL II, president of the Salt Lake City firm since 1942, was elected chairman of the board and W. T. NIGHTINGALE, vice president in charge of production, exploration, and transmission since 1945, was elected president. These changes resulted from the retirement of T. B. GREGORY as board chairman and treasurer. L. C. OLPIN is the new treasurer, and L. C. PESCHEL was elected to the new position of controller. J. D. ROBERTS continues as vice president in charge of distribution.

Election of C. EARL LAKIN as vice president in charge of gas operations was announced recently by The Dayton (Ohio) Power & Light Co. Mr. Lakin was western division manager of the firm. He was president and a director of the Indiana and Ohio subsidiaries of United Public Utilities Corp. from 1932 until Dayton Power & Light bought the firm's Ohio holdings in 1948.

R. F. HINCHEY, president of West Texas Gas Co., Lubbock, Texas, was named chairman of the board of directors at a meeting in Kansas City March 13. C. I. WALL, superintendent of city plants and vice president in charge of operations, was selected to succeed Mr. Hinchey as president. Simultaneous announcements of four other promotions were made at the meeting: T. S. WHITIS to vice president, transmission; H. F. HEATH to vice president, distribution; J. J. WILEY to vice president, accounting and budget control; and R. M. CURRY to assistant to the president.



R. F. Hinchey



C. I. Wall

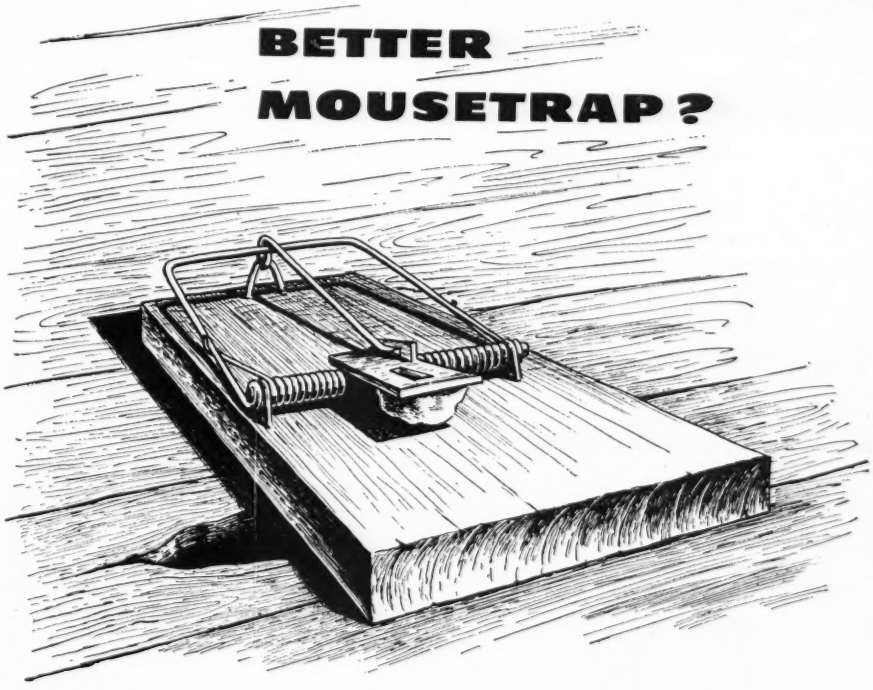
PERCY M. WINDER has retired as superintendent of the gas production department of Niagara Mohawk Power Corp. in Watertown, N. Y.

American Radiator & Standard Sanitary Corp. has appointed CHARLES T. WOODROOF to the newly created position of utilities sales engineer. He will headquarter at the company's general sales department in Pittsburgh. Mr. Woodroof has been associated with American-Standard for nearly 20 years, first as a salesman, and most recently as a specialist in gas-fired products in the firm's application selling department.

CORRECTION

Because of a broken type face in the Oronite Chemical Co.'s gas odorant advertisement appearing in our last issue, a completely misleading statement resulted.

Attention is called to the fact that Calodorant "C" gas odorant will vaporize in the line at the rate of 7 lbs per MMcf at 0° F, *1000 psi line pressure.*



The story of the reward for a better mousetrap is proverbial. But the fact remains that most mice are still caught by this simple, economical and effective contraption.

Gas purification is a parallel case.

Iron Sponge, preferred for the removal of H_2S seventy-five years ago, is still preferred today. And for these same reasons . . . simplicity, economy and effectiveness.

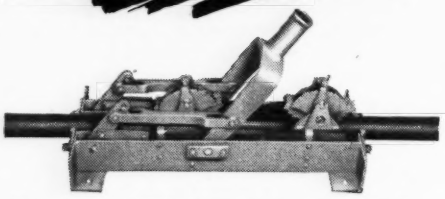
Iron Sponge operates with high efficiency at high or low pressures, has excellent capacity and activity, gives long service between foulings and is simply and quickly regenerated.

CONNELLY Inc.

3154 S. California Ave., Chicago 8, Ill.
Elizabeth, N. J. • Los Angeles, Calif.

The TROJAN pipe puller and pusher

Cuts costs, Saves time!

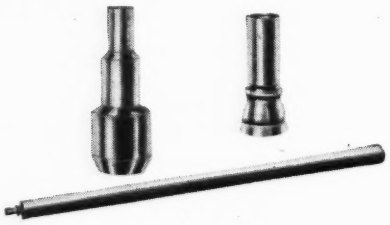


Heavy steel push pipe comes in 30 inch lengths . . . has all inside couplings, insures straighter travel, and requires a trench only 5½ feet long to operate the pusher. Joints are faced on ends to assure perfect alignment when screwed together.
Pilots and couplings are made large enough to pull covered iron pipe without destroying the covering.

Write today for literature and complete information.

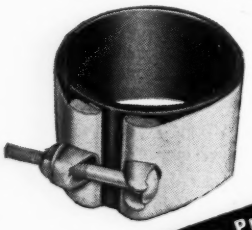
Simplifies installation or renewing of gas service lines under pavement

You get double action and continuous operation with a Trojan Model B Pipe Puller and Pusher. It's more than twice as fast . . . doesn't require any resetting of the grip . . . and pushes or pulls up to 2" pipe without additional dogs, clamps, or wedges.
The Model B has three pushing speeds for different types of soil and can be reversed in 30 seconds. It is constructed entirely of steel and weighs 140 lbs. Each part is heavy enough to withstand the most severe treatment.



The TROJAN Manufacturing Co., 1112 Race Drive
41 Greenway, Hamden, Conn. • Box 465, Memphis, Tenn. **Troy, Ohio**

STAINLESS STEEL BANDS AND
NEOPRENE RUBBER GASKETS
ASSURE PERMANENT REPAIR



SOLVE YOUR LEAK PROBLEMS PERMANENTLY!

ONLY STAUFFER PIPE REPAIR CLAMPS GIVE YOU ALL THESE FEATURES!

★EASIEST TO INSTALL UNDER WATER
★PRESSURE-TIGHT FIT! CONFORMS TO PIPE IRREGULARITIES
★OUTLASTS PIPE - CAN BE RE-USED!
★PATENTED OPEN-SLOT LUGS - SIMPLE DESIGN
★HIGHLY NON-CORROSIVE
★PERMANENT REPAIR!

LEAKS
BLOWOUTS
SHORT SPLITS

WITH THE REPAIR CLAMP YOU CAN TIGHTEN SAFELY

Trust your worst leaks to Stauffer Pipe Repair Clamps. The patented open-slot lugs make Stauffer Clamps easy to install in a few minutes even under water, without having to install the nut on the bolt or "fish" the bolt through a hole.

STAINLESS STEEL BANDS AND
NEOPRENE RUBBER GASKETS
ASSURE PERMANENT REPAIR

Sizes: ½ inch thru 24 inches for any kind and class of pipe. Stauffer clamps are 3", 6", 9" or 12" wide. Special widths and sizes on order.

Write for Literature.

STAUFFER MFG. CO. 2453 MERCED AVE., EL MONTE, CALIF.

R. H. Owens

R. R. Newquist

ROBERT H. OWENS has been elected president and general manager of Roots-Connersville Blower Corp., Connersville, Ind., succeeding the late John Avery. RALPH R. NEWQUIST, vice president in charge of sales since 1946, was elected executive vice president.

Election of J. K. HORTON to the new position of executive vice president was announced last month by the board of directors of Pacific Public Service Co., San Francisco. Mr. Horton has been secretary and legal counsel of the firm since 1945, and a director of Coast Counties Gas & Electric Co., a subsidiary, since 1948. At the same time, A. R. BAILEY, a director of Pacific Public Service and vice president in charge of operations for Coast Counties, was elected a vice president of the former company.

To forestall problems arising as a result of the national emergency, Hamilton Manufacturing Co., Two Rivers, Wis., has shifted its sales personnel. C. W. HALEY, southeastern field representative, will assist the sales director in the home office. His territory will be assigned to other salesmen or covered from Two Rivers. D. C. MCDERMAND has been named special utility representative and will be replaced in upper New York and New England by R. C. BURBRIDGE, former southwestern field man.

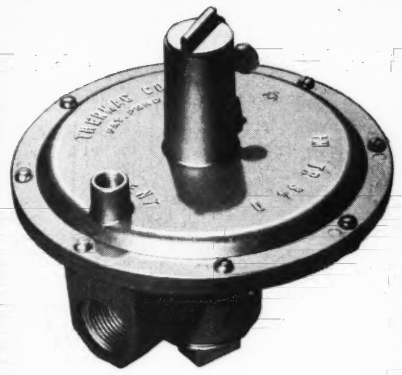
C. I. Weaver

Retirement of C. I. WEAVER as board chairman and chief executive officer of The Ohio Fuel Gas Co., Columbus, became effective March 1. He continues as a director. E. C. OVERBECK, president, has assumed Mr. Weaver's executive responsibilities. In 1930 Mr. Weaver joined Ohio Fuel as vice president and general manager. He was elected president in 1931 and continued as chief executive officer on his advancement to chairman of the board last year.

Duties formerly handled by H. G. LAUB, who recently retired from Southern California Gas Co., Los Angeles, have been assigned to GORDON G. DYE. The meter shops, distribution standards, and distribution training departments will report to Mr. Dye and will be headed by C. J. SEVEY, T. W. EASTMAN and G. H. BABB, respectively.

The Pittsburgh Group Companies' home service staff in Pittsburgh has been enlarged

GAS APPLIANCE REGULATORS
for years to come



OUTSTANDING PERFORMANCE
with Minimum Maintenance

The responsibility of an appliance manufacturer to produce a product with long trouble-free service has perhaps never been greater than it is today. As a builder of gas controls and of appliance regulators in particular, we share in this responsibility.

THERMAC Regulators are known for DEPENDABILITY. The simplicity of our design is assurance to THERMAC users of long uninterrupted gas appliance service. This means fewer service calls for the dealer and greater satisfaction for the customer.

Thousands of THERMAC Regulators have been in operation 15 years and more without repair. Insist on THERMAC for best in design, for accurate pressure and flame control, for high capacity and low maintenance cost.

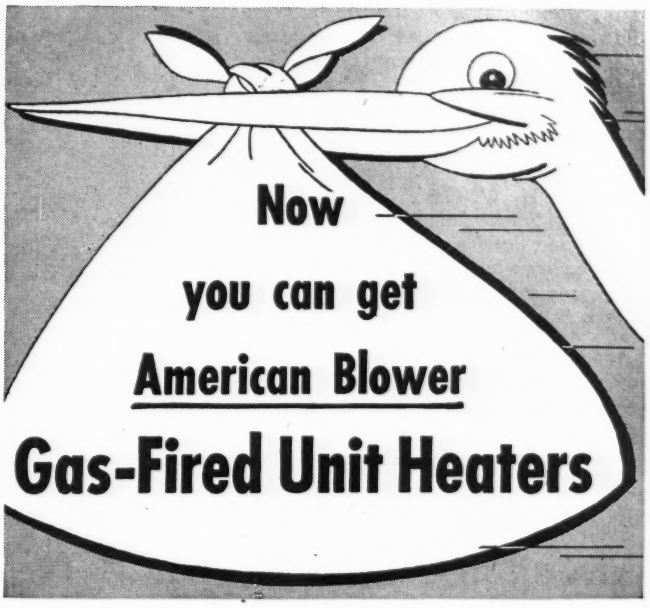
Sizes ⅛" to 2½" IPS. Certified by AGA.

THERMAC

800 East 108th Street HM Los Angeles 2, Calif.

COMPANY

"20 years experience in building gas controls."



To the fellow who's trying vainly to heat his shop with an overloaded boiler, here is good news.

You can buy a new American Blower self-contained Gas-Fired Unit Heater to add that extra heat *without* increasing the load on your already overworked boiler.

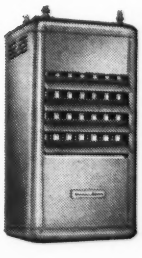
For American Blower, a time-honored name in the unit heater field, now offers a complete new line of Gas-Fired Unit Heaters for use with manufactured, mixed, natural or liquefied petroleum gases. They're ready, in a wide range of sizes, to meet many kinds of commercial needs.

They're handsomely enclosed in a sturdy steel casing that's bonderized for protection against rust and corrosion. The durable baked-enamel finish will harmonize with any modern business interior.

The combustion chamber of aluminized steel is built to resist corrosion. This tough, corrosion-resistant core adds many years of service to the unit.

We're sure that your customers will enjoy the warmth and savings that American Blower Gas-Fired Unit Heaters will bring them. Data on Gas-Fired Unit Heaters is available from Heating Supply Houses, Heating Contractors or the nearest American Blower Branch Office.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICH.
Division of AMERICAN RADIATOR & Standard Sanitary CORPORATION



American Blower Gas-Fired Unit Heaters are available in 7 sizes with capacities ranging from 70,000 to 230,000 Btu/hr. input. Write for Bulletin 7117.

YOUR BEST BUY!

AMERICAN BLOWER
UNIT HEATERS
Gas-Fired Models • Models for Steam or Hot Water

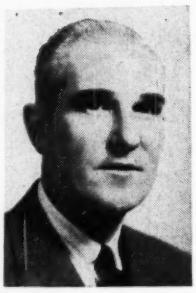
Serving home and industry AMERICAN-STANDARD • AMERICAN BLOWER
CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

by the addition of ELEANOR A. MARVIN, who formerly represented Manufacturers Light & Heat Co. in the Steubenville, Ohio, area. MARY MARTZ, home economist in the Connellsville, Pa., area, has succeeded Miss Marvin.

W. E. OTIS has been named administrative assistant to H. W. Geyer, director of the Robertshaw-Fulton Control Co.'s west coast research and development laboratory. Mr. Otis formerly administered the field observation program of Southern California Gas Co., Los Angeles.

Appointment of ROY A. DOMAN as assistant chief civil engineer has been announced by Peoples Natural Gas Co., Pittsburgh.

L. M. Cassidy



A. R. Fisher

Last month the board of directors of Johns - Manville Corp., New York, elected LESLIE M. CASSIDY chairman of the board and chief executive officer, and ADRAIN R. FISHER was appointed president. Mr. Cassidy fills the position held by the late LEWIS H. BROWN, who died on Feb. 26. From 1929 to 1946, Mr. Brown served as president, and from that time until his death, as chairman of the board. Mr. Cassidy, who joined J-M in 1926, was appointed vice president for sales in 1946 and became president of the company on Jan. 31, 1951. Since 1945, Mr. Fisher has been a vice president, and he was elected a director and appointed vice president in charge of asbestos mining last January.

Several retirements, promotions, and additions in its sales organization have been announced by Dearborn Chemical Co., Chicago. New eastern division managers are C. S. WHITE as head of the water treatment department, replacing S. H. OPDYKE, who retired Jan. 1; and HOWARD E. JOHNSTON, manager of "No-Ox-Id" sales, replacing the late C. A. REMSEN. R. O. BENSON, Chicago representative, replaces Mr. White in the Iowa territory. Other long-time employees who retired Jan. 1 are C. I. LOUDENBACK and M. M. KUTZER, Chicago, and B. E. CONLEY, Texas. C. C. DENNIS, Indianapolis service representative, has been transferred to the Chicago sales staff, replacing VINCENT P. NOBILE, recently assigned to New Jersey. PAUL E. FRANCE, M. H. JAMISON, and T. ZAGGY also were added to the Chicago staff, and other new salesmen include R. H. DERR, Pittsburgh; W. M. MORRIS, Pennsylvania; and V. E. STIERS, Oregon.

DONALD A. CAMPBELL recently joined Eclipse Fuel Engineering Co., Rockford, Ill., as vice president in charge of engineering and research, and CHARLES F. BISHOP of Dallas has been appointed McKee-Eclipse representative for Oklahoma and northern Texas.

Appointment of EDWARD A. HOLMBERG as manager, advertising department, Consolidated Edison Co. of New York Inc., was announced last month. Mr. Holmberg has been identified with ConEd's sales activities for more than 40 years, as manager of the appliance promotion bureau since 1946. He succeeded the late Dennis S. Melvin.

E. A. Holmberg
... ConEd

R. M. Buck
... Bryant

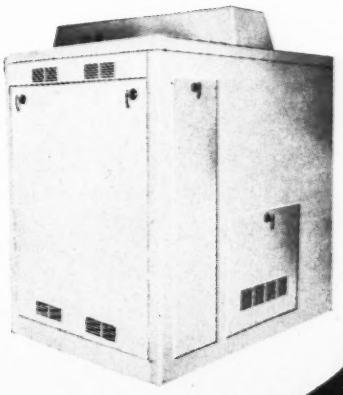
Bryant Heater Industrial Division, Cleveland, Ohio, has named ROBERT M. BUCK to succeed D. A. CAMPBELL as manager of the division. Mr. Buck has worked with industrial gas-fired equipment since joining Michigan Consolidated Gas Co., Detroit, in 1929. From 1938 to 1944 he served as industrial laboratory supervisor for Mich-Con, and he joined Bryant in 1944 as division engineer.

NO More HURDLES—
even in Gas Regulators
Now you can obtain a Gas Regulator happily "wed" to maximum efficiency and economical operation. The famous Maxitrol low pressure gas appliance reducing valves feature the exclusive "straight-thru" flow!
This means less energy loss, or a lower "pressure drop" which gives Maxitrol Gas Regulators a greater rated capacity.
This means manifolds of greater input capacity can be constructed without increasing to larger pipe sizes!
This means greater efficiency for your product with a resultant savings in manufacturing costs! Write us for further information and specifications.
DETROIT REGULATOR CO.
1742 RIVARD Maxitrol DETROIT 7, MICH.

» » » » » » » Hi-Pressure « « « « « « «
TANKS
Let us figure on Your Needs
The STACEY MANUFACTURING Co.
SINCE 1851
CINCINNATI 16, OHIO
GAS HOLDERS • HI-PRESSURE TANKS • PURIFIER BOXES
ENGINEERS • FABRICATORS • CONSTRUCTORS
An Independent Organization Not Affiliated With Any Other Builders of Gas Holders

Bottling, Brewing, Dairy Plants All Need Evans Heating Units!

• EVERY gas representative should KNOW that the Evans Automatic Heating Unit is the answer to the problem of heating caustic solutions for bottle washing machines. The old expensive and troublesome boiler has been supplanted by the Evans Unit! You just light this unit and forget it! Operates AUTOMATICALLY with a tremendous saving in fuel, time, bottles and insurance. Write us for full details.



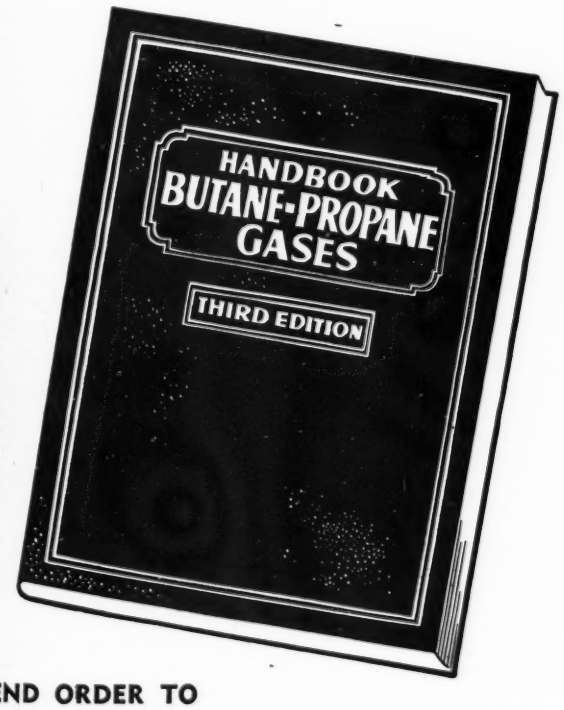
Manufactured by:

G. C. EVANS SALES COMPANY
LITTLE ROCK, ARKANSAS

EVANS

AUTOMATIC HEATING UNITS

352 PAGES of Technical Facts, Charts, Diagrams, Photographs, including Latest Processes and Materials



The Only Complete Reference Book on Liquefied Gas Engineering, Installation and Operation

CONTENTS:

The Progress of the Industry
The ABC of LP-Gas
Properties of Hydrocarbons in LP-Gas
Properties of Butane-Propane Mixtures
Volume Correction Factors
Analytical Determination and Testing
Natural Gasoline Plants, Recycling Plants, Oil Refineries
Delivery by Truck, Rail, Water, Pipe Lines
Storage Tank and Pressure Vessel Design
Liquid Metering and Pumping Systems
Installing and Servicing LP-Gas Systems
Semi-Bulk Systems
Bottled Gas Systems
Gas Utility Service from Central Plants
Multiple Utility Service from a Central Plant
Comparative Performance with Other Fuels
Appliance Installation and Testing
Domestic Applications
Commercial Applications
Industrial Applications
Enrichment, Peak Load and Standby Uses
Fuel for Internal Combustion Engines
N.B.F.U. Pamphlet No. 58 (1947)
Motor Carrier Regulations
Unloading Tank Cars
Marine Regulations
LP-Gas Insurance
Handy Tables for Field Use
Flame Weeding
Interchangeability of Other Fuel Gases with Natural Gases
Bibliography
Glossary of Terms

$7.50 Per Copy

We pay postage on orders accompanied by check or money order. In California add 23¢ for sales tax.

Orders from individuals must be accompanied by amount of purchase unless credit has been established.

SEND ORDER TO

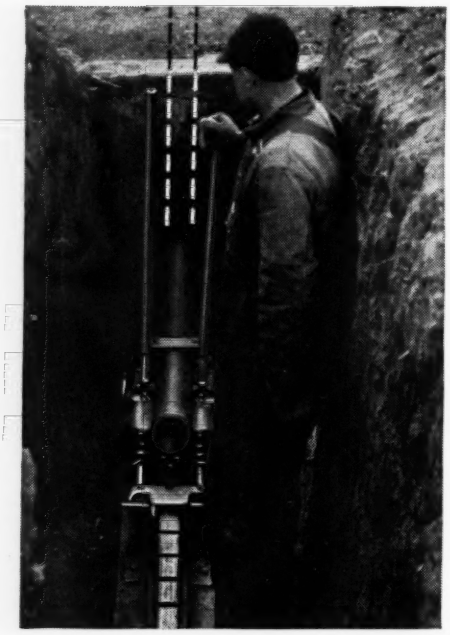
GAS

198 South Alvarado St.
Los Angeles 4, Calif.

PUSH PIPE

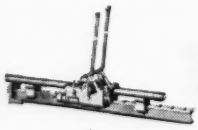
UNDER STREETS, WALKS,

TRACKS, FLOORS



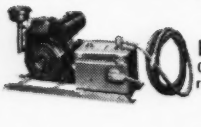
...with a GREENLEE PIPE PUSHER

Yes, here's the quick and simple way to install underground pipe. With a GREENLEE Hydraulic Pipe Pusher *one man* pushes pipe *under* obstacles. No tearing up of pavement, lawns, floors... eliminates extensive ditching as just a short trench accommodates the Pusher. No tedious tunneling, back-filling, tamping, or re-paving. Job time is cut to a fraction. Pusher often pays for itself through labor savings on the first job or two.



No. 790 GREENLEE PUSHER
For 3/4 to 4-inch pipe. Six Speeds—6,500 to 40,000 lbs. pushing pressure.

No. 795 GREENLEE PUSHER
For pipe larger than 4-inch, concrete sewer pipe, large drainage ducts. Six speeds—25,000 to 150,000 lbs. pushing pressure.



POWER PUMP for both sizes of GREENLEE Pushers. Pushes pipe at rate of two feet per minute.

TOOLS FOR CRAFTSMEN
GREENLEE

Get facts on timesaving Greenlee tools now. Write Greenlee Tool Co., Division of Greenlee Bros. & Co., 1944 Columbia Avenue, Rockford, Illinois, U.S.A.

Retirement of L. S. CHADWICK, president and board chairman of Perfection Stove Co., Cleveland, since 1922, became effective March 13. Mr. Chadwick joined the company as a consulting engineer in 1912 when the organization was known as the Cleveland Foundry Co.

BENJAMIN F. PEPPER, president of the Pennroad Corp., has been elected a director of United Gas Improvement Co., Philadelphia.

Obituaries

On March 9, E. HOLLEY POE, prominent gasman, died of a heart attack while visiting in Tulsa. He was 57. Mr. Poe became connected with the gas industry in 1918 when he joined Tidal Oil Co., now known as Tide Water Associated Oil Co. Two years later he moved to Tiger Mountain Oil Co. where he supervised natural gas and natural gasoline operations for its subsidiary, Henryetta Gas Co., Tulsa. In 1937 he resigned an executive position with that company to become secretary of the AGA's natural gas department in New York, remaining there until 1942 when he joined the Office of Petroleum Coordination for War. Mr. Poe later served as executive officer and general manager of the Petroleum Reserves Corp., an agency charged with making efficient use of foreign oil facilities to help supply American fighting forces. After the war, he represented Texas Eastern Transmission Corp., Houston, in their purchase of the Big and Little Inch lines. After retiring from his governmental duties, Mr. Poe also founded E. Holley Poe & Associates, New York engineering firm which he headed. In mid-1949 Mr. Poe became a co-owner and president and treasurer of the *American Gas Journal*.

E. Holley Poe

Northern Indiana Public Service Co., Hammond, has announced the recent death of THOMAS J. KELLY, Fort Wayne division manager. Mr. Kelly was an active AGA member, a past president of the Indiana Gas Assn., and a prominent member of its research committee.

A. H. CLARK, 61, former meter superintendent of the Atlanta (Ga.) Gas Light Co., died recently. Mr. Clark also had served as a special investigator for Georgia Power Co., Americus.

CHARLES E. GALLAGHER, 74, former president of East Ohio Gas Co., Cleveland, died March 7. Mr. Gallagher had retired in 1941.

Consolidated Edison Co.'s (New York) advertising manager, DENNIS S. MELVIN, died Feb. 27. He had been associated with the company since 1929.

ARTHUR S. HALL, superintendent of the Springfield (Mass.) Gas Light Co. since 1916, died March 5 at the age of 75.

NEW PRODUCTS

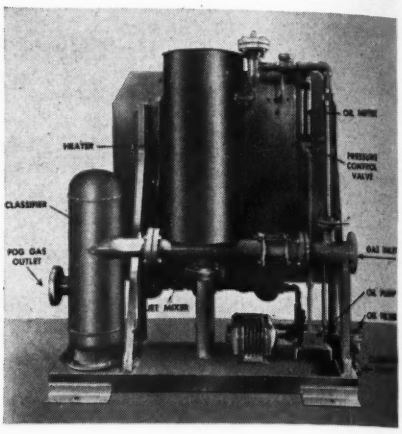
Fogger

BLAW-KNOX CO., 2033 Farmers Bank Bldg., Pittsburgh 22.

MODEL: Electroil fogger.

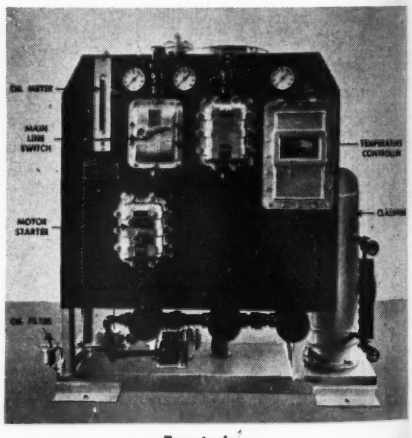
APPLICATION: To facilitate the distribution of natural gas through manufactured gas mains through introduction of a stable petroleum fog into the gas stream.

DESCRIPTION: This shop-assembled unit is electrically heated and has an automatic temperature controller and safety shutoff. It protects the distribution system by wetting down dust deposits, preventing their dislodgment; it prevents drying out of jute-joint packing, protects leather diaphragms, and inhibits internal corrosion of the steel.



Rear view.

In a typical installation, gas is taken from the main gas line ahead of a pressure regulator or an orifice which will produce the pressure drop required for operating the fogger. A controlled portion of this fogging gas is mixed with a metered supply of filtered oil and passed through the vaporizing coil in the heater to effect complete vaporization of the oil. A second and much larger portion of gas, referred to as sweep gas, passes through the jet mixer where it contacts the hot stream of vaporized oil and fogging gas, condensing the oil to a very fine fog. A centrifugal classifier removes any oversize droplets, thus insuring a stable fog. The fogged gas then enters the main gas line downstream from the regulator or orifice. Oil removed in the classifier can be returned to storage.



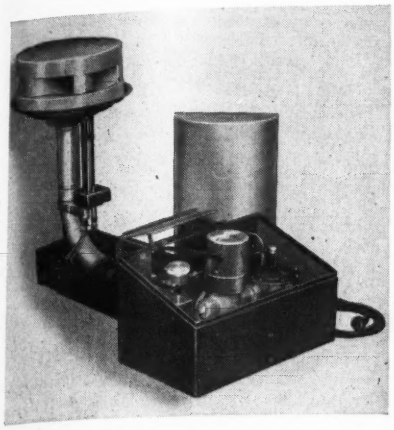
Front view.

Conversion Burner

VANRICH PRODUCTS CORP., 9000 Madison Ave., Cleveland, Ohio.

MODEL: El Van Ayre.

DESCRIPTION: Special features are the "cyclonic action" burner head, a fully auto-



matic self-relighting pilot, and a motor valve. Easily controlled carburetion and telescoping construction allow the unit to be adjusted for mounting in a variety of furnace types and sizes. Compactness of controls, transformers, and pressure regulator makes installation easy. A "plug-in" pilot arrangement and a pilot line filter are incorporated in the unit.

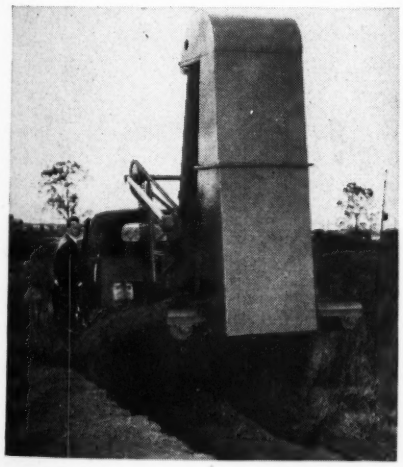
Mobile Ditcher

PEWTHERS DITCHER CO., 3530 Mansfield Rd., Shreveport.

MODEL: Earthripper.

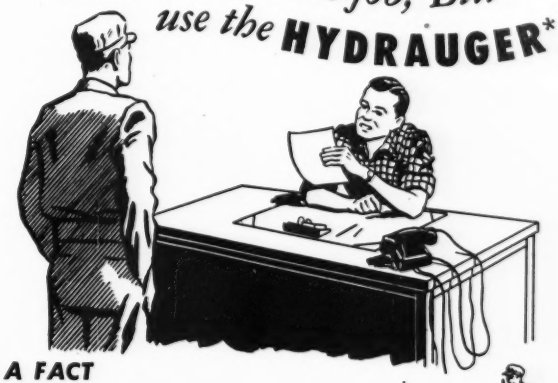
APPLICATION: Particularly suited for gas lines, extensions, and house-to-street service lines.

DESCRIPTION: Standardized for Ford trucks, this ditcher moves from one project



to another at the speed of the truck. The boom sheltering digging equipment is low enough so that telephone and lighting wires do not interfere. The ditcher is capable of digging a 5-ft ditch, 18 in. wide, at more than 15 ft per minute—two or three city blocks per hour. This is one of three models planned by the manufacturer.

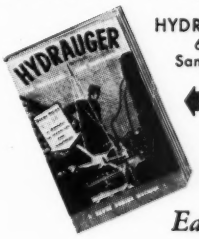
"... speed up that job, Bill — use the HYDRAUGER*"



IT'S A FACT

... on short runs (up to 200') underground pipe can be laid faster and at much less cost in Hydrauger BORED HOLES! (Bore diameters 2" through 24".)

operates by compressed air ... needs only a 2' 6" by 7' 6" trench.



HYDRAUGER CORP., Ltd.
681 Market Street
San Francisco 5, Calif.

GET FREE CATALOG

HYDRAUGER*

Earth Boring Tool

*Reg. U. S. Pat. Off.

HY-21C

A BEAUTY ... AND THE BEST IN

Peerless

GAS UNIT HEATERS

A COMPLETE UNIT IN ONE PACKAGE

QUIET FORCED AIR

meet the most exacting demands for efficiency ... quiet operation ... attractiveness ... low in height and priced to Sell.

Peerless Gas Unit Heaters are shipped from factory ready for power and gas supply. All gas controls and internal wiring completed.

Write today for new literature

EASY TO SELL
EASY TO INSTALL
THEY'RE STYLED FOR BEAUTY
BUILT FOR DUTY
AVAILABLE IN FIVE SIZES
A.G.A. APPROVED FOR ALL GASES

PEERLESS MANUFACTURING CORP, LOUISVILLE 10, KY.

Detectron 505
PIPE DETECTORS

FIRST WITH A METALCASE
FIRST WITH SHIELDED LOOPS
FIRST WITH "SURE GRIP" HANDLE
FIRST WITH LIFETIME GUARANTEE

The new DETECTRON Model 505 locates, traces and centers pipes and cables with speed and accuracy. Small, compact, lightweight—with HEAVY DUTY PERFORMANCE.

★ HIGHER QUALITY
★ LONGER LIFE
★ LOWER PRICE

TRIPLE VALUE!

For Complete Information Write for Folder 4-M

THE Detectron CO.
5637 CAHUENGA BLVD. NORTH HOLLYWOOD, CALIF.

Service Trencher

TRACTOR SALES CORP., 1409 Santa Fe, Los Angeles.

MODEL: Everett Trencher.

APPLICATION: For cutting small ditches for laying service lines.

DESCRIPTION: An improved model is now available, incorporating a McGee Angle Dozer (not shown). Hydraulically operated, the dozer is adapted for rapid backfilling.

Because of the machine's construction, it may be backed up flush with the house, the bucket line lowered straight down, and trenching started. The unit is adapted for Ford or Ferguson tractors, using the Everett Speed Reduction transmission with fingertip control. The trencher operates from the power takeoff, and is raised or lowered by a built-in system.

The reduction transmission also lengthens the tractor wheelbase, giving it greater stability.

The ditcher is highly mobile, moving from job to job under its own power, at speeds up to 15 mph. Digging speeds vary from 18 in. per minute to 5 ft, cutting trenches up to 42 in. in depth and 12 to 18 in. in width. Soon a newer model that will cut trenches from 6 to 8 in. in width, 42 in. deep, will be available.

Four forward speeds plus governor control of rpm give flexibility of operation under varying soil conditions.

STOPPERS | *Since 1897*

ALL KINDS OF
PIPE STOPPERS

★

Safety Gas Main
Stopper Company

523 Atlantic Ave. • Brooklyn 17, N. Y.
Cable Address: Gastopper, N. Y.

Gas Line Connection Leaks Are Costly...Dangerous!

Rectorseal #2 puts an end to this costly and dangerous gas piping problem. It positively and permanently seals all threaded connections against leaks. It is economical and easy to use.

Rectorseal #2 flows on smoothly, uniformly coating the threads. When the joint is made up it stiffens to the exact consistency required for a positive, permanent leak-proof connection. It does not become hard and brittle, will not "freeze" the joint.

Order your supply of Rectorseal #2, NOW.

RECTORSEAL, Dept. B
2215 Commerce Street Houston 2, Texas

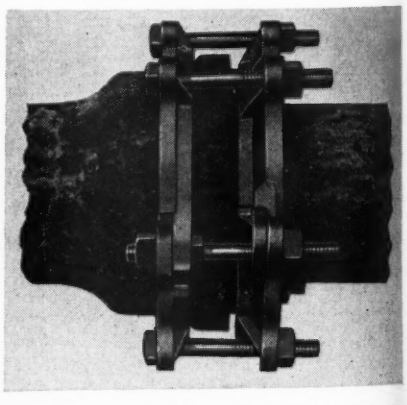
RECTORSEAL # 2

Bell Joint Leak Clamp

UTILITY CLAMP & EQUIPMENT CO., 1490 Calzona St., Los Angeles 23.

MODEL: Utility leak clamp.

DESCRIPTION: This clamp for repairing leaking joints in cast iron bell-and-spigot



pipelines consists of two segmental, malleable iron rings, a combination single ring gasket constructed of two kinds of rubber, and a

set of clamping bolts. In 10-in. and smaller sizes the bell rings are adjustable to accommodate different shapes and sizes of bell rings. In larger sizes both bell and spigot rings are adjustable.

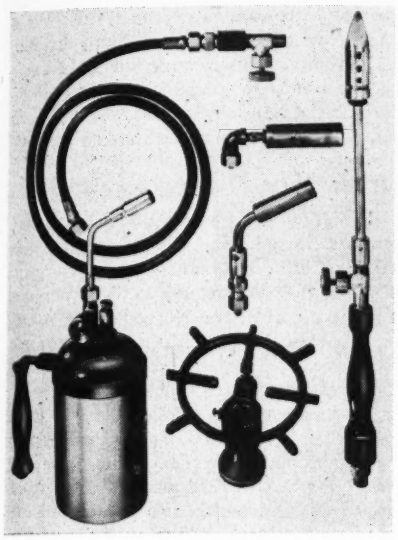
Most important new feature is the gasket which is constructed so that a soft rubber portion abuts the leaking joint in the bell and seals it. A hard rubber portion which is engaged by the spigot ring resists cold flow and holds the gasket under permanent pressure. With this arrangement, joints are usually made tight before the clamping bolts have been completely taken up, but it is preferable to bolt up firmly in order to provide insurance against future disturbances.

Portable Torch

MUTUAL LIQUID GAS EQUIPMENT CO. INC., 3616 W. Imperial Highway, Inglewood, Calif.

MODEL: B-91 LP-Gas torch.

DESCRIPTION: Compact and light, with heat-proof handle and weighted base, this



torch has a propane capacity of .91 lbs and operates continuously for about 4½ hours. The standard tip 491-B has a pointed, concentrated flame for fine work, and the assembly kit provides many tips for different types of work. No. 491-S has a blast type high-speed flame, good for field use since it won't blow out. The 491 has a broad flame for sweating of large copper pipe joints.

An auxiliary 4-ft hose attaches to the torch valve for use in close quarters. Accessories also include a soldering iron, filler adaptor, and a spider burner that locks to the torch head for liquefying metals, solutions, etc.

Insulating Bushings

GORDON Z. GREENE CO., 2335 E. 8th St., Los Angeles 21.

APPLICATION: To inhibit corrosion of service pipe by preventing flow of electric current between house and service pipe.

DESCRIPTION: These bushings are made of "Kraloy," a tough, chemically resistant plastic. When incorporated into an assembly with all threads fully engaged, they can

HEATH
GAS LEAK LOCATION SURVEYS
Any one, - or Any Combination of
THESE 4 WAYS

1. REGULAR VEGETATION AND SOIL SURVEYS
2. WINTER LEAK SURVEYS
3. SOIL RESISTANCE ELECTROLYSIS SURVEYS
4. SPECIAL SURVEYS FOR UNUSUAL OR CLAIM CASES

CONSERVE
THIS IMPORTANT NATURAL RESOURCE
"On-the-Job" Recommendations Made by Engineer
WRITE PHONE WIRE
HEATH
TREE SERVICE INC.
WELLESLEY, MASS., RICHMOND, MICH.
"You Can't Sell Gas That Leaked Out"

BUTANE PROPANE
WARREN
PETROLEUM CORPORATION
LIQUEFIED PETROLEUM GAS DIVISION
TULSA, OKLAHOMA
SALES OFFICES:
FORT WORTH, TEXAS
HOUSTON, TEXAS
LOUISVILLE, KENTUCKY
MADISON, WISCONSIN
MIDLAND, TEXAS
MOBILE, ALABAMA
MT. VERNON, ILLINOIS
NEW YORK, NEW YORK
OMAHA, NEBRASKA

Whether your cooling tower is new or old—natural or induced draft—let a qualified Fluor Service Representative study your maintenance and repair problems—at no cost to you!

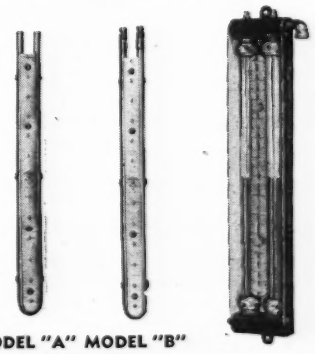
2 FREE SERVICES AVAILABLE

1 PREVENTATIVE MAINTENANCE — Fluor will recommend a preventative maintenance program based on operating conditions and locale—and then arrange for periodic inspections!

2 ESTIMATES FOR REPAIR—Fluor will inspect to determine repairs necessary to bring your tower back to original design efficiency—then bid for the job competitively!

Inquire through any Fluor Office
THE FLUOR CORPORATION, LTD.
2500 SOUTH ATLANTIC BLVD., LOS ANGELES 22, CALIF.
offices in
NEW YORK • CHICAGO • TULSA • HOUSTON • SAN FRANCISCO

NORWALK MANOMETERS
For Water, Mercury, Oil or Glycerine

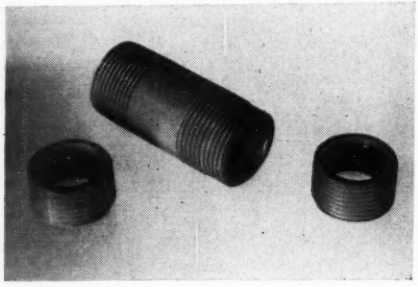


MODEL "A" SERVICE TYPE
Ideal for Serviceman's Kit
MODEL "B" HEAVY DUTY TYPE

MADE IN ALL SIZES and TYPES
For pressure or vacuum use. Service Type has unbreakable tubing and will stand abuse. Send for bulletin 3100M for complete data and prices.

NORWALK VALVE COMPANY
South Norwalk, Conn.
Manufacturers of
NORWALK-CONNELLY REGULATORS
Since 1878

withstand temperatures from 32° to 120° F or a bending moment of 100 ft-lb, and a torque of more than 75 ft-lb is necessary to cause failure of either internal or external threads. The manufacturer claims that these



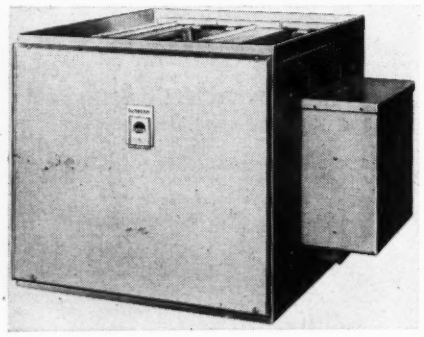
bushings will not deteriorate by shrinking, swelling, cracking, or disintegration when exposed to alternate wetting and drying in a makeup assembly, nor are they affected by pipe dope.

Air Cleaner

AMERICAN RADIATOR & STANDARD SANITARY CORP., Pittsburgh, Pa.

MODEL: Magne-filter air cleaner.

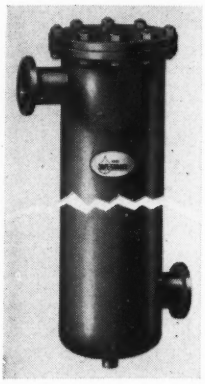
APPLICATION: This electronic, dry-type



air cleaner removes dust and dirt from the air by electrical attraction. Installed in the return duct of any air heating or cooling system, it traps particles of dust and dirt as small as .00001 in. in diameter.

DESCRIPTION: Because the Magne-filter has filter cells as its collector element, it will continue to filter the air if the electrostatic action is interrupted. There are seven sizes with two to eight filter cells and air volume from 600 cfm for the smallest to 2100-2400 cfm for the largest. The cleaner requires no water or drainage connections and consumes about as much electricity as a 25-watt bulb.

Vapor Remover



SELAS CORP. OF AMERICA, Erie Ave. & D St., Philadelphia 34.

MODEL: Vape-Sorber.

APPLICATION: For continuous removal of petroleum vapor from compressed air and other gases.

DESCRIPTION: The Vape-Sorber is installed in air or gas lines to instruments and critical pneumatic operations where "oily" air has detrimental effects. In addition to removing petroleum vapor, the device removes water, free oil, water-oil emulsions, and dirt. Liquid-impervious ceramic filters operate in conjunction with specially compounded activated carbon to deliver clean air-gas to operating equipment, with no moving parts.

Other New Developments

Model 90-WM "In-the-Wall" heating system was introduced in January by Coroaire Heater Corp., 1422 Euclid Ave., Cleveland 15. Designed to heat 3½ to 6½-room, one-floor, low-cost homes or apartments, as well as small business establishments of equivalent size, the system has 10 distinct advantages, according to the manufacturer . . .

A three-stage conversion gas burner for natural, manufactured, and mixed gases is being produced by Perfection Stove Co., 7609 Platt Ave., Cleveland 4. The AGA-approved Superfex GC-31 is equipped with automatic controls and is available with 6-, 8-, 10-, or 12-in. diameter flame spreader. The firm has also introduced two gas furnaces—the Model 66 "Homogen-Air" which features uniform air distribution, and the Model 67 winter air conditioning gas furnace . . .

Primary feature of Lennox Furnace Co.'s (Marshalltown, Iowa) new GC1 conversion burner is the single-port design, labeled "Glo-Ring." A corrugated, stainless steel flame retention ring located in the port opening slows velocity of the air-gas mixture around the edges of the opening so a constant ignition flame burns right down on the port opening. Two models cover a Btu-input range from 60,000 to 300,000 . . . Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, has announced a new Speedomax electronic recorder which features a range continuously adjustable over a 20-to-1 ratio, and zero suppression adjustable over more than twice the maximum range . . .

A high-velocity unit air filter, Type HV, has been introduced by American Air Filter Co. Inc., Louisville 8. Made of corrugated strips of fine mesh wire, the filters are designed to operate at velocities up to 500 fpm and to maintain high cleaning efficiency over a wide range of air velocities.

GAS CLASSIFIED

Classified advertising is set in 6-point type, without border or display, at the rate of 15 cents per word per insertion; minimum charge per insertion $3. Box numbers for replies count as 5 words. Count as a word each one letter word and each group of figures. Classified advertising is only accepted when payment accompanies order. Copy and payment must reach publisher's office prior to 10th of month preceding publication.

SALES MANAGER — MANUFACTURED GAS Property. High Potential Salary and Commission. Must build load number of customers, appliance, sales, free reign to successful, experienced man, eastern United States. Write fully in confidence. Box 35, GAS, 198 So. Alvarado St., Los Angeles 4, California.

SERVICES AVAILABLE. DISTRIBUTION AND Service Dept. Superintendent. 24 years experience with water gas. Some experience with Propane, Propane-Air and Natural. Good habits. Well recommended. 2,000 to 4,000 meters preferred. Box 45, GAS Magazine, 198 S. Alvarado, Los Angeles 4, California.

DEPENDABLE L-P GAS

UPG®

FUEL SUPPLY
EQUIPMENT
ENGINEERING
CONSULTING SERVICE

UNITED PETROLEUM GAS COMPANY
806 Andrus Building · Minneapolis 2, Minnesota

M-SCOPE PIPE FINDER

MODEL AB
ONE MAN OPERATION
METAL CABINETS
HEAVY DUTY PERFORMANCE
ONLY
$149.50

FISHER RESEARCH LAB., Inc.
PALO ALTO, CALIFORNIA

Contractors • Engineers • Consultants

LP-GAS SPECIALISTS

H. EMERSON THOMAS & ASSOCIATES, INC.
P. O. BOX 270, WESTFIELD, N. J.
TEL. 2-2800

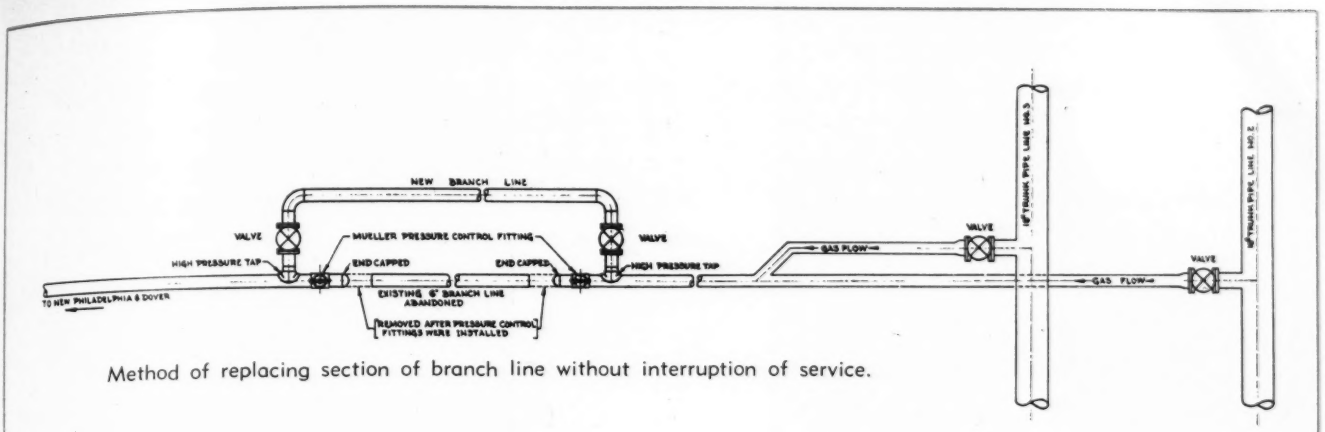
Experience • Service • Reliability

WANTED

GAS ENGINEER

Large and expanding utility company located on the Eastern seaboard needs experienced gas engineer to assist in contemplated conversion to higher B.T.U. gas. Permanent position is offered to man with at least 5 years of experience in transmission, distribution and conversion problems.

Please write giving full particulars of personal background, education, experience and salary desired. All replies will be treated with the strictest confidence. Address Box 10, GAS Magazine, 198 S. Alvarado St., Los Angeles 4, Calif.



Method of replacing section of branch line without interruption of service.

One-Way Gas Traffic

SEVERAL miles east of New Philadelphia, Ohio, in picturesque Tuscarawas county, a single 6-in. branch line connects to two of East Ohio Gas Co.'s giant trunk pipelines (TPL No. 2 and TPL No. 3) which extend to Cleveland from their origin at the Ohio river. This lone 6-in. steel artery supplies adequately the natural gas demand of the neighboring towns of New Philadelphia and Dover, two of the 85 communities served by East Ohio. Normal trunk line pressures of 200 lbs are carried in the branch line to a pressure reducing station on the outskirts of New Philadelphia, where average city pressures are maintained.

In early August of last year, East Ohio's engineers undertook the replacement of 900 ft of pipeline in the branch line. With but a single line serving the communities, it was necessary to plan the replacement as a bypass installation. Service could not be interrupted, so pressure control fittings were used.

The new line, of 8-in. diameter, was laid parallel to the defective section. Welding saddles were first attached to the active line at points ahead of and beyond the section to be removed from service. Nipples were installed and Mueller gate valves were welded into the saddles. Full line-sized drillings were then made, under 200-lb pressure, through the open gate valves. With these two connections made to the old line and tied into the new 8-in. line, gas flowed through both the old and new lines.

Now the flow of gas had to be stopped in the old 6-in. branch, the connections severed, and the line capped in preparation for abandonment. In order that stoppers might be installed, it was advisable that pressure in the line first be reduced below 100-lb, which also caused a drop in temperature of 1° for every 15-lb reduction, thus affording an extra safety factor during the primary welding operations in the installation of the pressure control fitting.

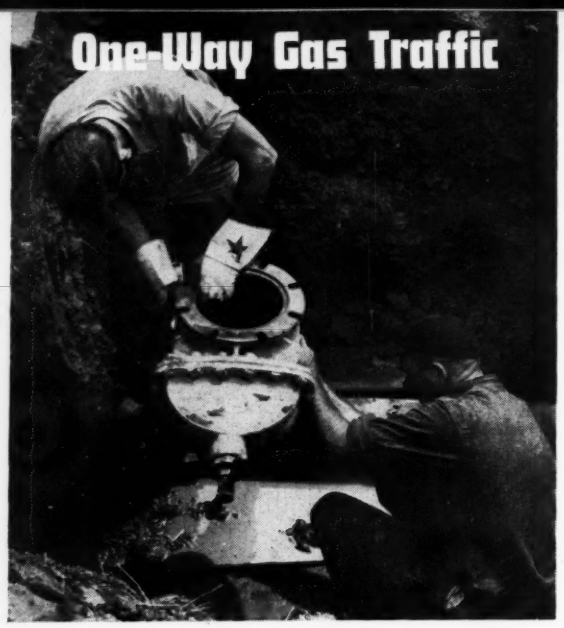
Pictured on this and the following pages is the sequence of operations in inserting the stopper and plugging off the old line, while in service.

Rewritten from an article by Don E. Buckley, associate editor, *The East Ohio News*. Photos and story are presented through courtesy of that publication.

1. First step in replacement of a single main is reduction of pressure in the branch line from 200 to 90 lb, as shown above. Pressure readings are transmitted by radio-equipped vehicles.

2. Split pressure control fitting is welded to the 6-in. branch line as 90-lb gas pressure flows through the line.

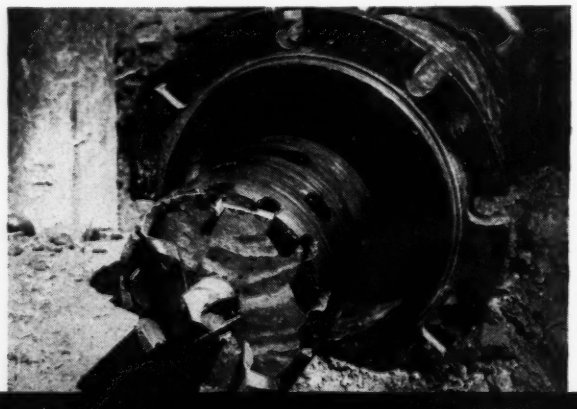
One-Way Gas Traffic



3. This step is the key to all further operations —the temporary installation of a Mueller gate valve, which will permit the drilling, insertion of the stopper, and finally the installation of the completion plug.

4. Mainliners attach power-operated drilling machine to gate valve.

5. Thirty-five minutes later the cutter was drawn up through the gate valve, the gate valve closed, and the drilling machine disconnected. Note the pilot drill in center of the shell cutter which assures the extraction of the pipe drillings.



6. Progress of the 6-in. shell cutter, operating through the open valve gate, is checked by a gauge on the drilling machine. Gauge is set at zero when the shell cutter touches the top of the pipe, has to register 6⅝ in. to indicate that cutter has passed through pipe. Drilling operation is entirely automatic.

7. Stopping machine (with rubber stopper extended) is being prepared for attachment to the gate valve (now closed).

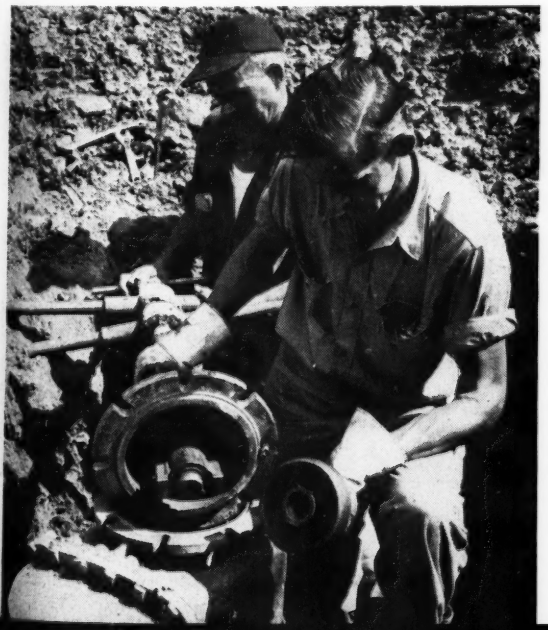
8. Stopping machine with stopper retracted.

One-Way Gas Traffic

9. Bolting the stopping machine to gate valve. After flange joint has been made leakproof, gate valve is again opened and the plunger pushed down to seat the stopper in the pressure control fitting.

10. In an operation similar to sealing a thermos bottle with a patented rubber stopper, the line stopper is being compressed and expanded by tightening the yoke of the stopping machine. When a like operation on the other extremity of the project is completed, the section to be abandoned is ready to be cut off and capped.

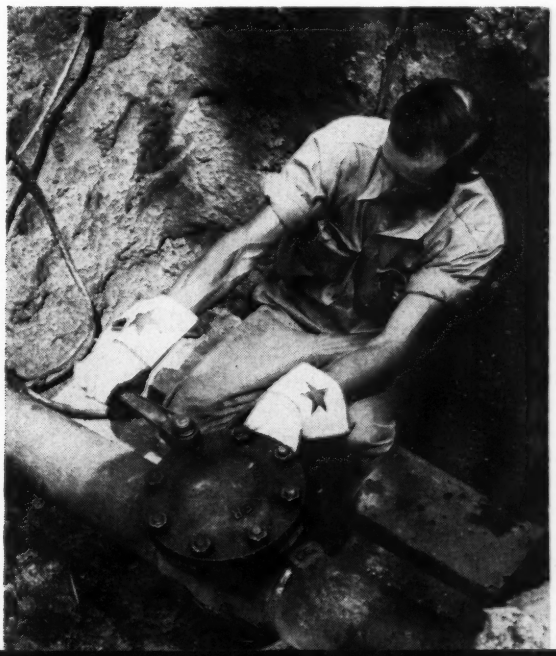
11. With the old branch line severed and stoppers removed, the completion machine is next employed to screw a 6-in. plug into the tapped recess of the pressure control fitting.

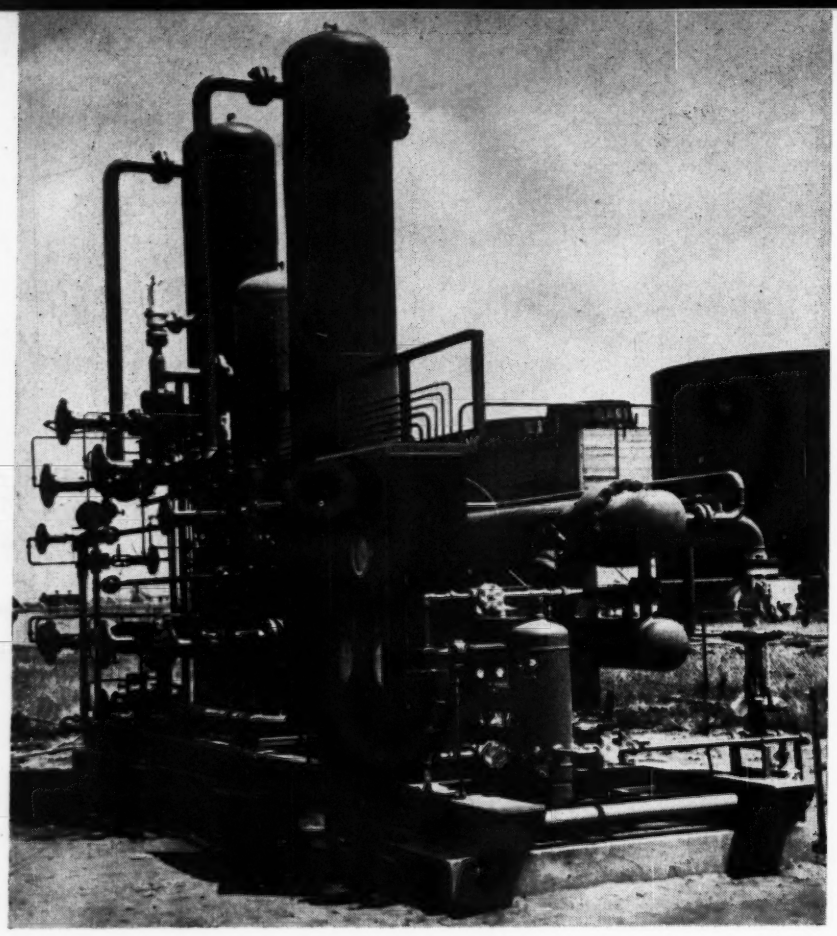


12. Here the plug is being attached to the completion machine.

13. Plug goes down through the open gate valve as workers screw it into the pressure control fitting.

14. Installation of the completion caps on both pressure control fittings provides extra protection to the inner plugs already installed. The caps also allow access to the pressure control fittings in the event of future use.





Skid-Mounted Solid Desiccant Dehydrators Built for Transco

By C. B. AMES

The packaged unit shown above, complete with control cubicle and numerous diaphragm motor valves, combines features of two installations described in articles appearing in GAS in 1950. In the May issue (p. 131), Charles R. Hetherington described Michigan-Wisconsin Pipeline Co.'s solid desiccant type dehydration plant, which utilizes florite. In August (p. 98), L. Harman Peahl wrote of a skid-mounted glycol dehydration plant. This article, reprinted from INSTRUMENTATION, *tells of skid-mounted plants of the solid desiccant type.*

THE importance of natural gas dehydration prior to its transmission in pipelines to consumer markets is today well recognized. Major reasons given for this process of water removal include: (1) prevention of freezing or the formation of hydrates, which can block the line; (2) minimizing of corrosion in the lines and other operating equipment in contact with the gas; and (3) elimination of the purchase of unsalable water vapors and reduction of the horsepower requirements to move gas through the line, resulting in higher operating efficiency.

The Transcontinental Gas Pipe Line Corp. system will transport a portion of 585 MMcf per day of dehydrated natural gas in its 30-in. 1800-mile pipeline from the Rio Grande Valley to New York City. To meet this demand, Fish Constructors Inc., has been erecting near the gas fields 15 plants designed to dehydrate the gas to a dew point of 25° F.* These units are of the solid desiccant type, employing florite, and are all identical in design and instrumentation—varying only in size to provide capacities which range from 5 to 30 MMcf per day.

Operation of the plants is basically cyclic in nature with two towers or contactors being used alternately. One tower is kept on stream until its bed of florite desiccant is saturated; then it is switched off to be regenerated while the second tower is simultaneously placed on stream. In the switching process, involving 12 on-off type diaphragm motor valves, the need for reliable automatic control to supplant manual operation is paramount. In addition, temperature and flow must be constantly regulated in the system, if uniformly dried gas of the proper specifications is to be obtained.

Shown in the accompanying photograph and schematic diagram, essential components of the dehydration plant comprise: (1) two contactors which range in diameter from 2 to 4 ft and in height from 12 to 16½ ft, depending on the plant capacity; (2) a gas-fired heater for regenerating gas; and (3) a regeneration gas cooler where dehydrated gas is heat exchanged with gas from the tower under regeneration. Not shown on the diagram are two additional units of the plant, namely: an inlet separator which removes oil and entrained solids from the incoming wet gas, and a water separator which removes moisture accumulating from the regenerating gas.

The process, described in more detail below, basically involves a 16-hr operating cycle with each contactor on stream for eight hours, while the other is being regenerated for four hours and cooled for four hours. Regeneration is accomplished by a stream of natural gas bypassed off the main line of wet gas and heated to 350° F prior to its passage through the desiccant bed in the contactor. All equipment is operated under a pressure of 800 psi.

One general feature of the instrument system is its complete independence of outside sources for power. All clocks for chart drives and operation of the time cycle controller are seven day, spring driven. Pneumatic controls and fuel gas for the heater in the system are supplied from a line tapped off the dehydrated gas line, the pressure being reduced in two stages from 800 psi to 25 psi by means of conventional pressure-reducing valves.

Operating sequence of the on-off type diaphragm motor valves which serve to switch contactors (coded by number-letter combinations on the diagram) is monitored by a time cycle controller through two control manifold systems, as shown. This instrument contains two poppet valves operated by cams which are rotated by means of a seven-day, spring-driven clock. Connected to the diaphragm motors of separate three-way valves, output gas pressure from the cycle controller is either applied or bled through these poppet valves—thereby governing whether full 25-psi gas pressure or zero pressure is maintained in each of the manifold lines to the diaphragm motor valves.

To follow the cycle of operation in detail, it will be assumed that No. 1 Contactor is on stream. Main flow of gas is down through valve *1B*, into No. 1

Mr. Ames is vice president, Fish Constructors Inc., Houston.

* Equivalent to 6 pounds of water per million cubic feet of gas at 800 psi pressure.

For steel, cast iron and Transite pipe. Single massive bolt simplifies installation. We suggest ordering 30 days ahead of requirements.

M. B. SKINNER COMPANY

SOUTH BEND 21, INDIANA, U. S. A.

SKINNER-SEAL SERVICE SADDLE

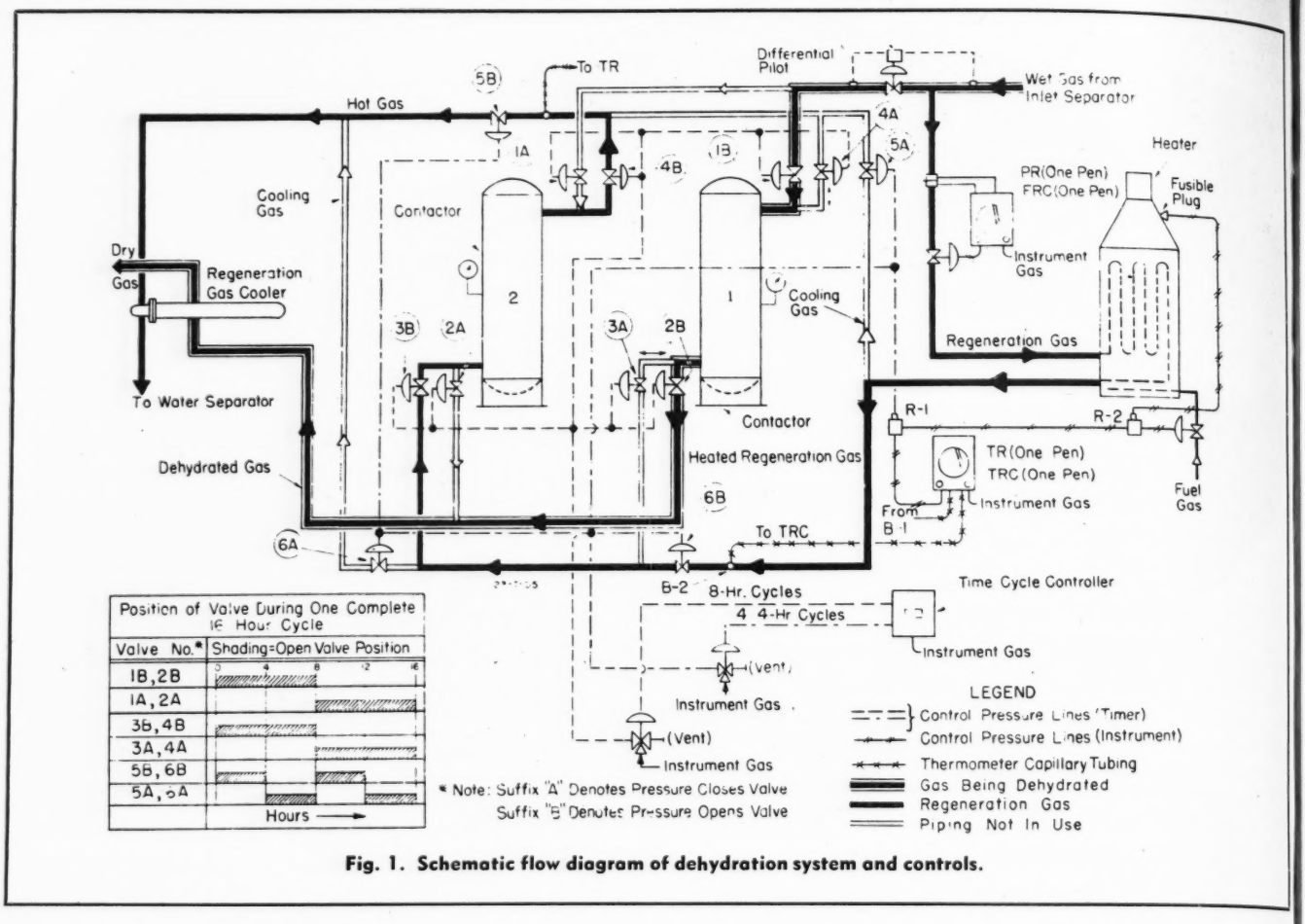


Fig. 1. Schematic flow diagram of dehydration system and controls.

Contactor, and out the bottom through valve *2B*. Thence, the dehydrated gas flows out of the system, passing through the regeneration gas cooler. This flow continues for eight hours.

No. 2 Contactor is cut off from the main gas stream by valves *1A* and *2A* which are closed. To provide heated natural gas for regeneration of this unit, some 10% of the main gas stream is diverted by means of a diaphragm motor valve installed in the main gas stream. This valve is positioned by a "differential pilot" which operates from pressure taps downstream on the main flow line and upstream at the inlet separator; sufficient back pressure is thereby created to provide the by-pass flow of gas for regeneration.

As shown on the diagram, regenerating gas is flow controlled by a Brown mechanical meter *(FRC)* through a diaphragm motor valve; the meter also incorporates a pressure spiral and second recording pen for logging the system pressure of about 800 psi. The gas passes through coils in the heater, and then branches into two flow lines: up toward valve *5A* and down toward valve *6B*. For the first four hours, however, valve *5A* is closed, so that flow is only in the lower line through valve *6B*, which is open during this same period.

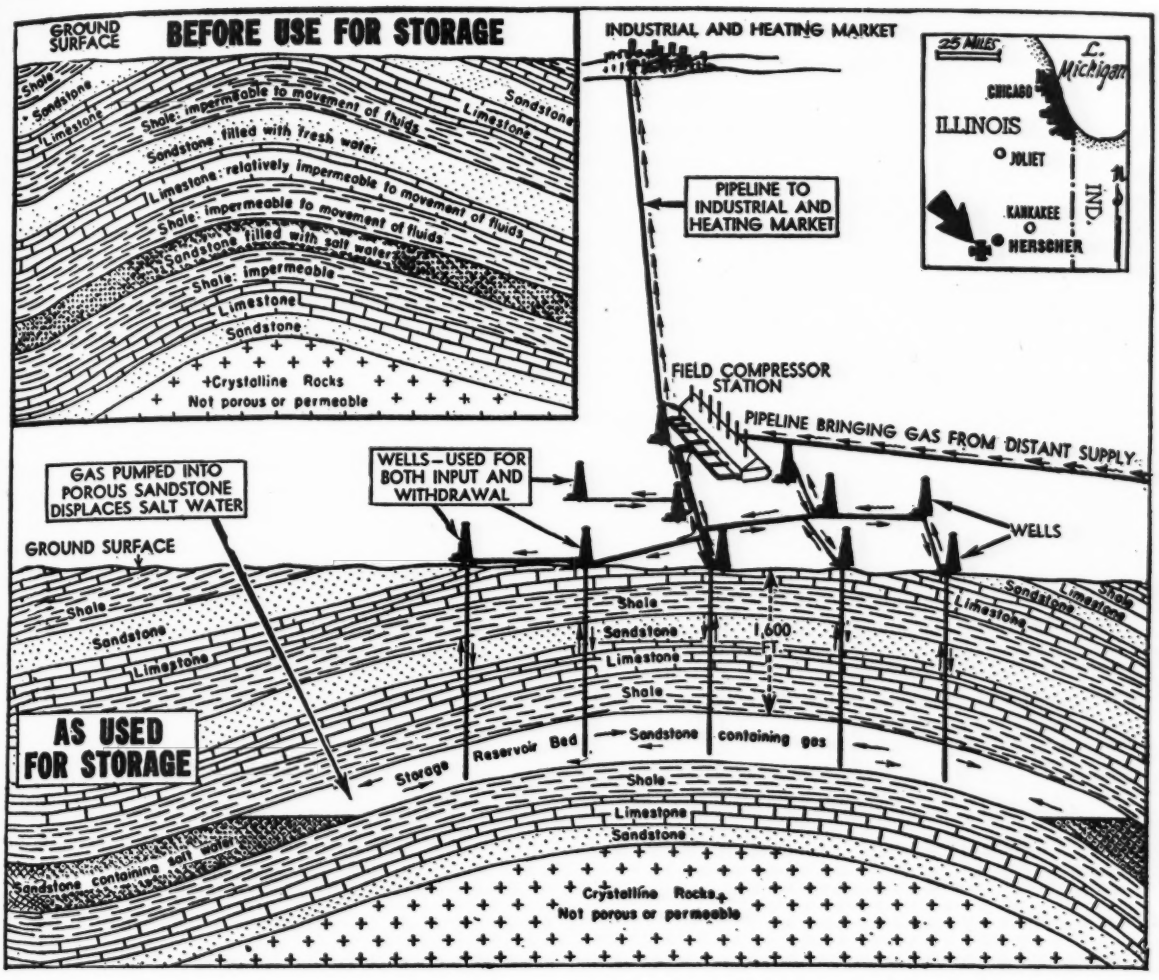
Further, as seen from the chart of valve positions, valve *6A* in the lower line is closed, thereby diverting the heated gas up through No. 2 Contactor via valve *3B* on the bottom inlet line. The latter valve, as well as the valve *4B* on the top outlet line of the contactor, is open for the full 8-hr period; and during the first four hours permits the flow of heated regenerating gas up through the contactor bed. Moisture laden hot gas passes out through valve *5B*, being cooled by heat exchange with dehydrated gas in the regeneration gas cooler, as shown.

During the second half of the 8-hr period, the dried bed of No. 2 Contactor is cooled by the flow of unheated regenerating gas which passes up through valve *5A*, down through the contactor via valves *4B* and *3B*, and then through valve *6A* on out of the system to the gas cooler. This operation is initiated by the time cycle controller which closes the fuel gas line to the heater, as described below, and cuts off the 25-psi gas supply from one manifold line to reverse the positions of the appropriate diaphragm motor valves (see *Fig. 1*).

A mercury-filled type Brown thermometer *(TR-TRC)*, range 0° to 500° F, serves to record and control temperature of the regenerating gas, as well as to record on the same chart, temperature of the moisture laden gas leaving the tower. The latter temperature is measured by a stainless steel bulb, *B-1*, inserted in the common line from the two contactors, as shown on the diagram. As hot gas dries out the desiccant, this bulb serves to record the gradual temperature rise and final leveling off when the bed is dry from top to bottom. Thus, it will indicate the drying rate which can be adjusted by changes in the set point of flow controller *FRC*.

For temperature control of the regenerating gas, a second bulb *B-2* is located in the heater outlet line ahead of valve *6B*, as shown. A narrow-band proportional control unit in the Brown recorder throttles control gas which normally passes directly to the fuel gas control valve through pneumatic relays *R-1* and *R-2* (Honeywell Type R048A). In accordance with the temperature set point of *TRC*, the fuel valve is thus positioned to maintain a constant temperature of regenerating gas.

Pneumatic relay *R-1* serves to cut off control gas from *TRC* and thereby close the fuel gas valve at the end of the four-hour regeneration period. This is accomplished by connection of the relay pilot in the impulse line from the time cycle controller, as shown. Pneumatic relay *R-2* also serves to cut off control gas from *TRC* through the action of a fusible plug which is installed to melt at 1100° to 1125° F, thus venting instrument gas pressure in the event of excessive heater stack temperature.



Artist's conception of dome rock formations in which Peoples Gas Light & Coke Co. proposes to store natural gas deep underground in area around Herscher, Ill.

Peoples Optimistic Over Storage Prospects

"ENCOURAGING RESULTS" have been reported in Peoples Gas Light & Coke Co.'s search for underground formations suitable for storing gas in Kankakee county, Ill., according to a recent report from the Chicago utility.

The tests, first announced publicly last fall, have progressed to a point where the existence of a dome-like structure similar to those in which gas is frequently found is definitely indicated. Late in February, 17 drillings had been made to a depth of 500 ft.

Oil and gas are typically found in porous sandstone layers, trapped by overlying layers of nonporous limestone and shale. In the area where the tests are being carried out, the sandstone is permeated with salt water.

The plan involves drilling to the standstone, about 1600 ft down, and pumping in gas to displace the salt water. The gas would be confined at the perimeters by water pressure above, and below by nonpermeable rock.

Drillings were said to indicate that the gas would spread under an area of about 15,000 acres. A bore was being drilled to the 1600-ft depth for injection purposes.

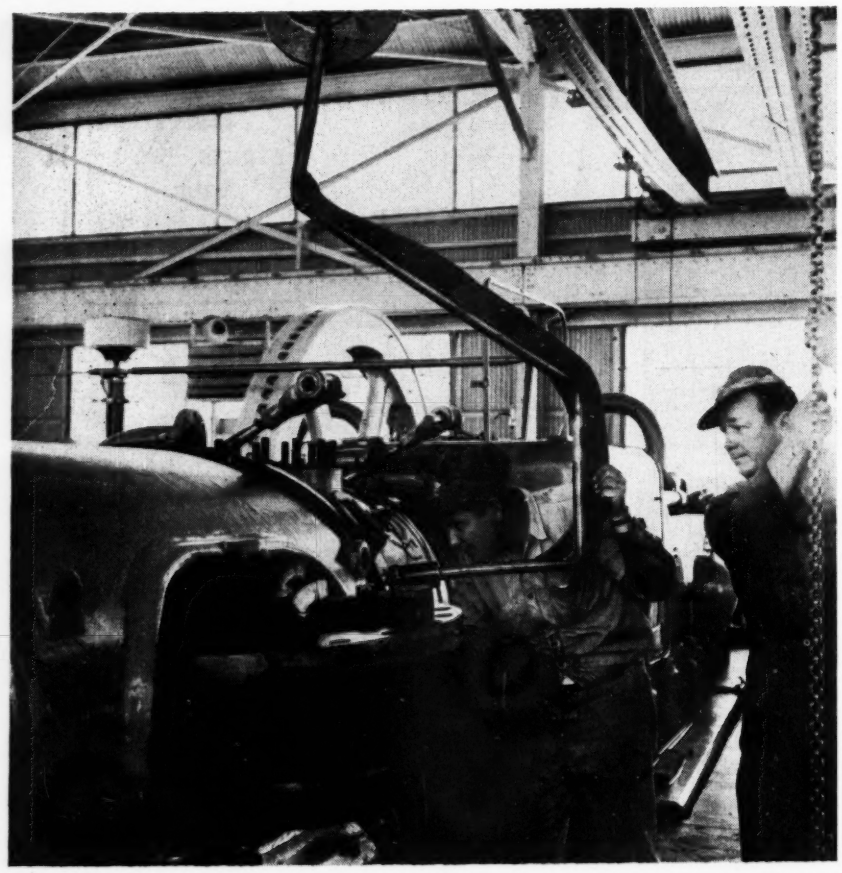
The Kankakee county project (the exact location is Herscher, 15 miles southwest of the city of Kankakee) is but one of two new storage projects under examination by Peoples and affiliates. The second involves the excavation of caves in favorable formations. It is presently being tried out in a mile square area of Livingston county, Ill. Company geologists are searching for a stratum of nonporous limestone of sufficient thickness to allow the drilling of huge chambers.

Although Peoples has remained mum on the more technical phases of the project, the map illustrating the project, reproduced from the Chicago *Tribune*, shows the type of formation being developed at Herscher.

A legal question which has arisen in connection with the exploitation of such structures has threatened to stall completion of the project, and bills have been introduced within both the Illinois legislature and the U. S. Senate in an effort to circumvent it.

The first move was made by State Sens. Walker Butler and Arthur Bidwill, Chicago Republicans, who introduced a bill which would empower gas utilities to invoke eminent domain to secure the rights for gas storage at levels more than 500 ft below the surface of privately owned property. It would also authorize gas storage beneath state or municipally owned property, with compensation to be fixed by the Illinois Commerce Commission.

Natural gas companies, by virtue of Sec. 7 (b) of the Natural Gas Act, are already granted eminent domain for purposes of installing pipelines and



AFTER . . . and before. Above, two men, using the special lifter, gently guide the cylinder head into place with a minimum of effort. Below, using the old method, men tug and haul, with ropes, chains, and crowbars.

CLOSEUP of the lifter, which has since been strengthened and improved.

Cylinder Head Lifter Saves Time, Labor

A 60% saving in labor and a contribution to safe operation have been accomplished in the invention of a cylinder head lifter now in use by Colorado Interstate Gas Co., Colorado Springs.

The product of the combined inventive abilities of Luther Legg, Charles Harford, and Vern Watkins of CIG, the lifter reduces the labor force required to slide a cylinder head into place in a Worthington horizontal engine from five men to two. Also eliminated are ropes, chains, and crowbars formerly used on the operation.

The body of the lifter is fabricated from a round piece of 1 ¼-in. length of solid steel, reinforced with a solid-welded fin of ½-in. flat iron. A swivel joint connects the angled steel to a heavy 2- by 4-in. bar which bolts to the cylinder head.

Improvements in the device that have been made since the photographs were taken include the replacement of the swivel joint with a rigid connection and the extension of the fin to support the horizontal section of the lifter. This latter improvement will eliminate the bending of the bar as is apparent in top photo.

compressor stations. However, there has been to date no specific federal authorization for extending this right to underground storage areas. Certain states, however, including Michigan, Kentucky, and West Virginia, already have such enabling statutes.

James F. Oates Jr., chairman of the board of Peoples, declared that passage of such legislation was imperative, as a single objecting property owner might block the entire project, or might force the extortionate payment of damages.

The Senate bill was introduced March 1 by Sen. Paul Douglas of Illinois. Under its terms, Sec. 7(b) would be amended to permit the condemnation of land or rights in land for underground storage. Senator Douglas pointed out that, while such action on a state level as has been taken by the several states is "helpful, the subject is fundamentally national in scope.

"It is an inevitable concomitant of federal regulation of the industry that a federal right to condemn for storage purposes be granted to all projects nationally authorized. Acquisition of storage facilities of an interstate pipeline requires authorization under the Natural Gas Act. Private negotiation is highly inadequate for this purpose."

The language of the act as presently written is "probably not broad enough" to permit condemnation, he said.

The Butler-Bidwill bill would give utilities no rights to oil, gas, or other resources found. It also specified that projects must not injure any water resources. Mr. Oates said the "bubble" system of storing gas would prevent leakage and damage to usable water or crops.

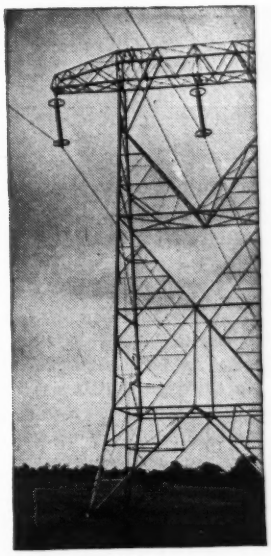
* * * *

A knotty peak-load problem in the Chicago area has added urgency to the search for storage.

Chicago and other cities in northern Illinois and Indiana are presently served by two pipelines, delivering a combined total of 223 MMcf per day, which is mixed with manufactured gas for ultimate consumption. Last winter's peak day hit 370 MMcf. Peoples' new subsidiary, Texas-Illinois Natural Gas Pipeline Co., is building a $130 million line from Texas, which will have a capacity of 383 MMcf but will only deliver 83 MMcf of this to Peoples. Although scheduled for completion Nov. 1, it will provide gas for only an additional 46,000 customers, far short of the 90,000 on Peoples' waiting list. At present only 3000 are being accepted each month.

Six more pipelines would be required to meet the peak demands of customers of the several companies in Illinois who are participating in the Kankakee project. The cost would run past $1 billion. If successful, the storage would accomplish essentially the same ends at from $25 to $30 million.

Panorama OF PROGRESS

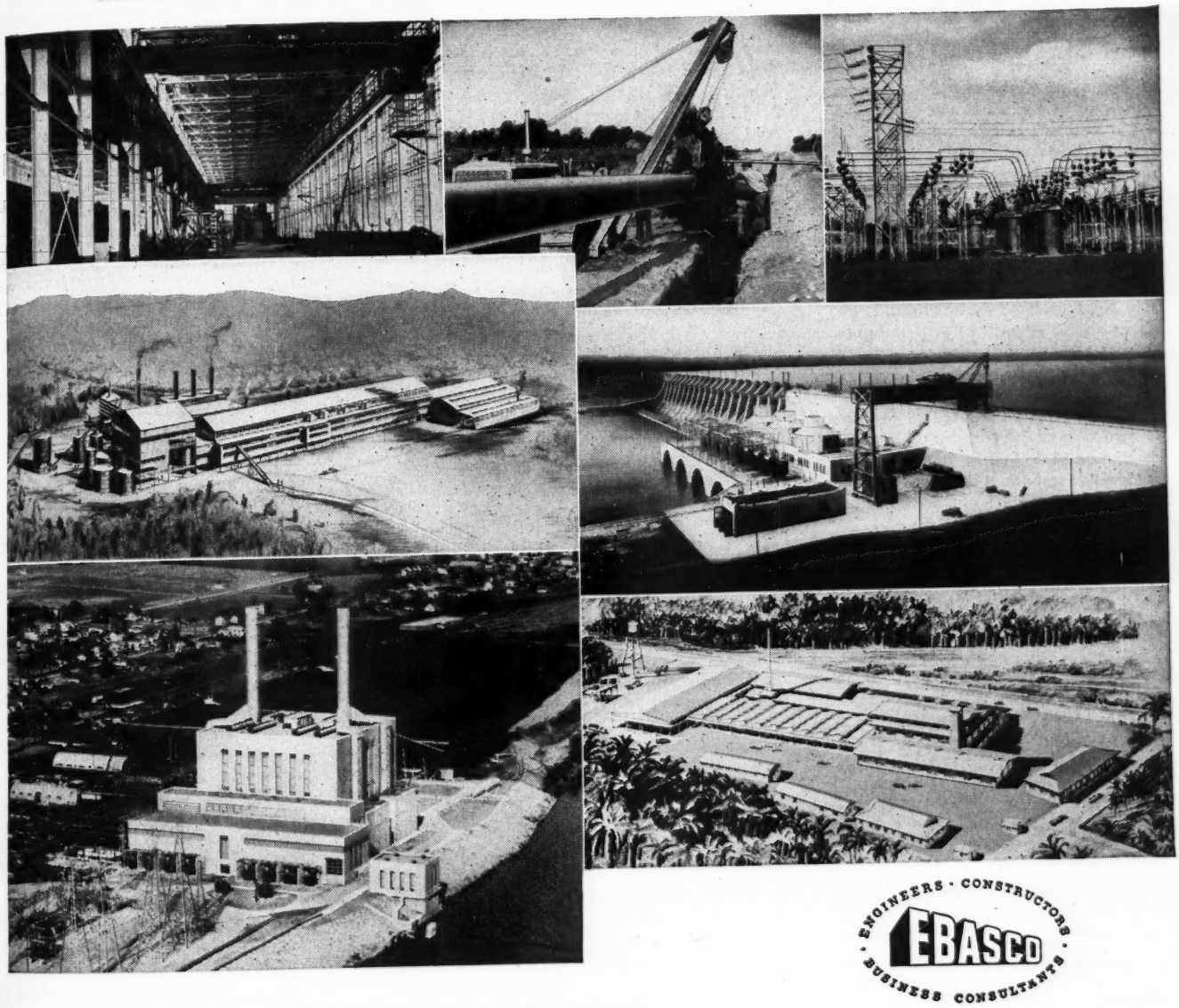


A few examples of EBASCO's extensive, world-wide engineering and construction activities are pictured here. Industrial plants—steam electric stations—hydro electric projects—natural gas pipelines—each built quickly and efficiently with the aid of competent EBASCO teamwork.

Here is progress—the American way! These projects are a tribute to the initiative of business management in providing the modern facilities that give America the world's highest standard of living.

Now and for the future, wherever the need for such progress arises, EBASCO stands ready to do the job.

Send for the booklet *"The Inside Story of Outside Help."*
Address Ebasco Services Inc., Dept. B, Two Rector St., New York, N. Y.



ENGINEERS · CONSTRUCTORS · EBASCO · BUSINESS CONSULTANTS

EBASCO SERVICES

INCORPORATED

NEW YORK · CHICAGO · WASHINGTON, D. C.

Ebasco Teamwork gets things done anywhere in the world

Appraisal	Design & Construction	Insurance & Pensions	Research
Budget	Financial	Office Modernization	Sales & Marketing
Business Studies	Industrial Relations	Purchasing	Systems & Methods
Consulting Engineering	Inspection & Expediting	Rates & Pricing	Taxes
			Traffic

PIPELINE NEWS

Natural Gas for Remaining New England Areas Approved In Record-Breaking $240 Million Certification

In a single record-breaking move, the Federal Power Commission recently authorized construction and operation of—

New pipelines totaling 2321 miles;

Compressor horsepower aggregating 160,000;

At a total cost of $240 million.

The action also opened the way for service to the remaining areas of New England not previously covered in authorization of Northeastern Gas Transmission Co.'s line.

The combined dockets of Algonquin Gas Transmission Co., Boston, Texas Eastern Gas Transmission Corp., Shreveport, La., and United Gas Corp., also of Shreveport, each of which will participate in the construction work authorized, were pointed chiefly at the job of getting gas to the northeast. General strengthening of the latter two companies' systems as well as service to other areas was also implicit, however.

United sells to Texas Eastern which sells to Algonquin.

Northeastern Still Hopeful

The way was not quite clear, however. Northeastern, which all along has battled for the sole right to serve New England, had carried its appeal for a review of the order to the courts last month, and was hopeful that the decision might be over-ridden.

United's certificate, largest of the three, entails the outlay of $111,861,749 to cover the construction of 1000 miles of line and the installation of 63,000 hp in existing and new compressor stations. Capacity will thereby increase by 920 MMcf to a breath-taking 3.8 billion per day.

Texas Eastern will spend $96,305,118 for 791 miles of 30-in. line and 96,400 hp in 13 compressor stations to carry an additional 741.5 MMcf per day to its customers. This volume will boost capacity from 465 MMcf per day to 1.2 billion.

Algonquin will build 253 miles of main line and 279 miles of laterals at an estimated cost of $30,477,800. Capacity will be 217.8 MMcf per day.

United will split its deliveries among Texas Eastern, which will receive 390,250,000 ft on a peak day, and 135 billion annually; and Mississippi River Fuel Corp., St. Louis, which will receive 150 MMcf on peak days and 52½ billion annually.

Two major lines will be built by United—a western line 510 miles long, of 30-, 26-, and 24-in. pipe, from Agua Dulce field in southwestern Texas to Perryville, Ia., with compression facilities totalling 42,400 hp; and an eastern line, including 305 miles of 20- to 30-in. line from the Pure Oil Co.'s offshore acreage in the Eugene Island area of the Gulf of Mexico through Louisiana to a point near Kosciusko, Miss., with 20,800 hp of compression. Three supply and delivery lines, totaling 179 miles, will extend from southern and southeastern Louisiana and Mississippi gas fields to various points of connection with the east line.

Texas Eastern's project will embrace a line running from a connection with United's system near Kosciusko, Miss., through Alabama, Tennessee, Kentucky, and Ohio to a connection with its own system at Connellsville, Pa. The following companies will be served the following volumes: Consolidated Natural Gas Co., 50 MMcf; Columbia Gas System, 15 MMcf; Equitable Gas Co., Pittsburgh, 10 MMcf; Carnegie Natural Gas Co., Pittsburgh, 5 MMcf; Waynesburg (Pa.) Home Gas Co., 600 Mcf; National Gas & Oil Corp., Newark, Ohio, 11 MMcf; Associated Natural Gas Co., Tulsa, 3 MMcf; Missouri Utilities Co., Columbia, Mo., 3 MMcf; County Gas Co., Atlantic Highlands, N. J., 2 MMcf; Algonquin, 220 MMcf; Jersey Central Power & Light Co., Asbury Park, N. J., 9 MMcf; Borough of Chambersburg, Pa., 2,210,000; Arkansas - Missouri Power Co., Blytheville, Ark., 6,308,000; and City Gas Co., Phillipsburg, N. J., 1.7 MMcf.

Algonquin's system will connect with Texas Eastern's mainline near Lambertville, N. J., with 150 miles of 26-in. running from there to Hartford, Conn. From there, 103 miles of 24-in. will extend as far as Boston.

The following will be served thereby:

Massachusetts: Brockton, Taunton, Fall River, Cambrige, Dedham & Hyde Park, New Bedford, Milford, Boston, Old Colony, Buzzards Bay, Norwood.

Rhode Island: Blackstone Valley, Providence, Newport, Westerly, and Warren.

Connecticut: Mystic, New London, Waterbury, New Haven, Willimantic, Putnam, New Haven, Hartford, and Norwich.

New Jersey: Jersey Central Power & Light.

Buchanan Dissents

Commissioner Buchanan agreed in part with the majority ruling which issued the certificate, and dissented in part, holding that the FPC was wrong in leaving unsettled the problem of Algonquin's rates, since it is upon the economic feasibility that the largest questions lie. He also questioned whether Algonquin should receive the 220 per day, since there is ample market for it in the Columbia Gas System.

He also noted for the record that Algonquin has shown that it will lose money on the operation for the first two years, leading to the conclusion that the project has not been proved feasible.

The day following certification, Texas Eastern announced that construction work would start immediately. First shipments of pipe had already arrived, ground and aerial surveys had been completed, and rights-of-way acquisition had begun. Completion is anticipated before next winter.

Meantime, Northeastern's appeal for review of the order had gone to the Third Circuit Court of Appeals. Northeastern and Tennessee Gas Transmission Co., its supplier and parent, charged that duplication of facilities would cost New England customers $3 million annually and would necessitate the use of 50,000 extra tons of steel. The companies charged FPC had refused to hear evidence from Northeastern on its bid to serve all of New England, denied it the right to present testimony to that effect during Algonquin hearings, and refused to hear its application for the right to buy gas from Texas Eastern.

FPC last month was also considering Northeastern's request to substitute larger pipe for that already authorized. Northeastern wants to use 24-in. instead of 26-in. Commissioner Buchanan held that no further hearings were necessary, as Northeastern has already shown its need.

Finally, FPC consolidated hearings of six New England utilities seeking gas from Northeastern. They are: Portland (Maine) Gas Light; Biddeford & Saco (Maine) Gas Co.; Gas Service Inc. and Allied New Hampshire Gas Co., Exeter; Greenfield (Mass.) Gas Light; and Gardner (Mass.) Fuel & Light.

Colorado Interstate To Aquire Canadian River

The long-disputed acquisition by Colorado Interstate Gas Co., Colorado Springs, of the facilities of Canadian River Gas Co., also of Colorado Springs, was authorized by the Federal Power Commission last month. Commissioner Buchanan dissented.

Last July FPC authorized the two companies to build pipeline facilities to carry additional natural gas to the Rocky Mountain area. At that time the commission denied the acquisition, pending further testimony on the reasonableness of payments by Colorado to Southwestern Development Co., which controls Canadian River. Hearings on this phase were held Feb. 26.

Terms of the merger provide that rights to liquid hydrocarbons in place will be granted to Southwestern Development, with Colorado to receive 50% of the gross proceeds from the sale of certain liquid hydrocarbons and 15% of the net revenue from hydrocarbons obtained from the operation of Texoma Natural Gas Co.'s Fritsch natural gasoline plant.

FPC specifically stated that if costs attributable to the hydrocarbons exceed amounts payable to Colorado pursuant to the transaction, this excess is not to be considered a cost of service to Colorado's gas customers in any proceedings concerning Colorado's rates. Also, the company is not to propose any rate increases, subject to FPC jurisdiction, attributable to the acquisition and merger. Furthermore, so long as it is economically feasible to produce natural gas from reserves acquired from Canadian, Colorado is not to sell, transfer, or alienate such reserves.

The commission found that "such acquisition will not adversely affect Colorado's supply of gas and will permit Colorado to better serve its customers at present rates."

In his dissenting statement, however, Commissioner Thomas C. Buchanan stated that "the decision unjustifiably deprives the gas consumers of Denver, Cheyenne, and the Rocky mountain area of a saving in gas rates

Gas conservation at Chitwood

WITH EFFICIENT, MULTI-SERVICE

GMV's

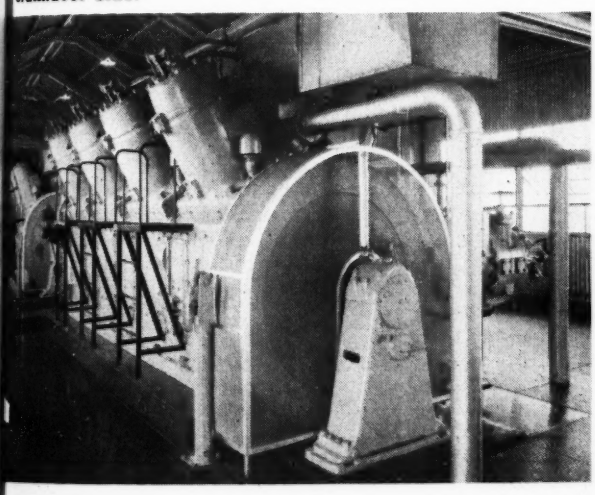
At the Chitwood plant, Magnolia Petroleum Company is doing an outstanding job of gas conservation . . . perhaps unique. The operation includes production of distillate by cycling . . . production of gasoline from casinghead gas . . . vapor recovery off of crude at atmospheric pressure . . . and a pressure maintenance operation.

The operation is of particular interest because it involves both high and low pressures, together with the vapor recovery service — all tied into the same compressor units.

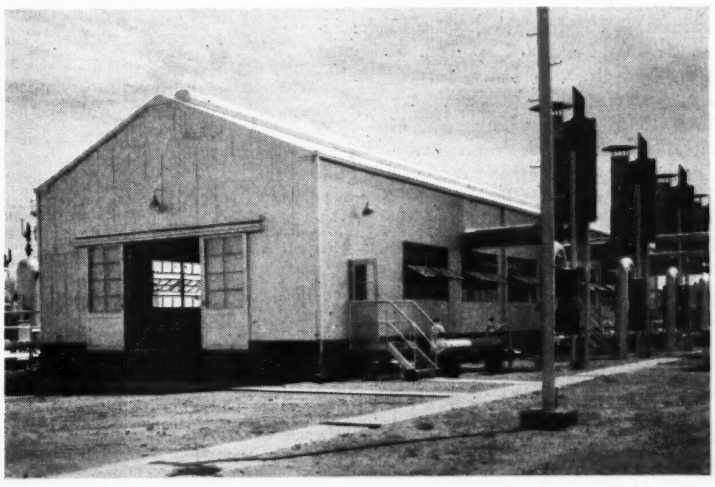
As shown opposite and below, the compressors are efficient Cooper-Bessemer GMV Turboflows — chosen partly because they assure the true flexibility so essential in a multi-service operation such as this.

Whether your plans call for complex compressor service or the most simple kind of set-up, you'll be ahead with Cooper-Bessemer V-Angles. Then you'll be *sure* of economical installation, prolonged, low-cost performance, and the *flexibility* to meet fixed or variable requirements precisely. Better check with Cooper-Bessemer.

GMV's in Magnolia Chitwood plant, shown here from crankdoor side.



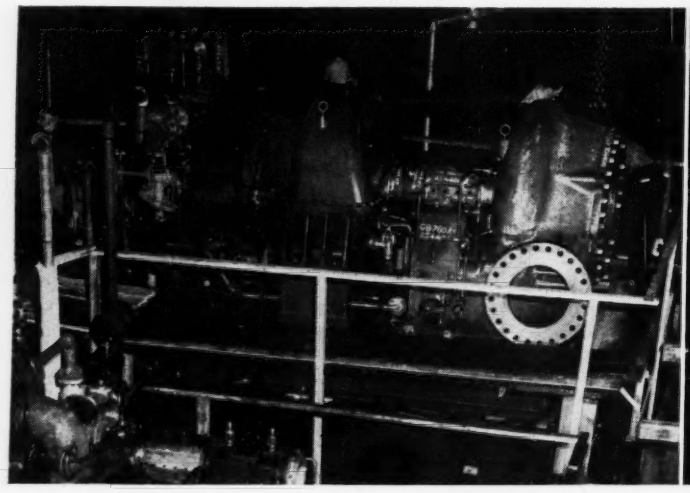
Exterior view of compressor building at Magnolia's Chitwood plant.

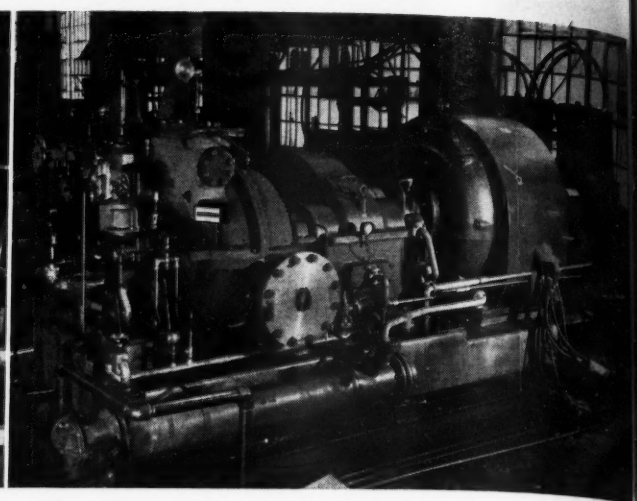


by **Cooper-Bessemer**

MOUNT VERNON, OHIO AND GROVE CITY, PENNA.

Tulsa Shreveport St. Louis Los Angeles Chicago Caracas, Venezuela





The first De Laval turbine driven centrifugal compressors for high pressure natural gas transmission are going into service for Transcontinental Gas Pipe Line Corp. on its gigantic Texas-to-New York trunk. Shown above at left is one of the three 5000-hp steam-driven units that will help to drive 603,190,000 cu ft per day through Transco's booster station No. 7 near McComb, Miss. At right is one of six 800-kw turbine generators built for Transco. Two will supply station power in each of the three booster stations using centrifugal compressors. Steam for driving them is at 600 psig, 750°F with 20 psig back pressure, generating 480-volt, three-phase, 60-cycle power. Both units are shown on the De Laval test floor.

of approximately $800,000 on an annual basis; and . . . is completely at odds with fundamental principles of regulation vigorously espoused by this commission and approved by the United States Supreme Court." The merger is entirely one of increased gains for stockholders, Mr. Buchanan asserted.

Jacksonville Firm Plans 254-Mile Line

A $23.5 million project—a 254-mile line from Jacksonville to St. Petersburg, Fla.—has been presented to the FPC by South Atlantic Pipe-Lines Inc., Jacksonville. About 50 miles of laterals, a compressor station and metering, regulating, and appurtenant facilities would be included.

The main line would connect with other lines in the Jacksonville vicinity, extending south to serve Green Cove Springs, Palatka, De Land, Sanford, Winter Park, Orlando, Kissimee, and Haines City; west to Lake Alfred, Lakeland, Plant City, Tampa, Booths Point, Dunedin, Clearwater, Largo, Pinellas Park, Gulfport, and St. Petersburg; and a lateral south again to Nichols, Mulberry, Pierce, Brewster, Agricola, and Pembroke.

Preliminary studies indicate a potential firm load of 115 MMcf daily and an interruptible load of 140 MMcf per day in the fifth year of operation.

PG&E Building Three New Boosters on Super Inch

Preliminary work is under way on three compressor stations to be built on Pacific Gas & Electric Co.'s Super Inch line at a cost of $12 million. Capacity of the big line will be doubled by these three plants—from its present 200 MMcf per day to 400 MMcf by next fall.

At Topock, Ariz., six compressors with a total of 15,000 hp will be installed in a 183-ft x 50-ft building. Each machine is 32 ft long, stands 14 ft high, and weighs 116 tons. An 8½-acre site has been laid out at Hinkley, Calif., eight miles west of Barstow, and this station will have seven compressors like those at Topock. The main compressor building will be 223 ft x 50 ft.

The third installation will be made adjacent to PG&E's existing Kettleman Hills, Calif., compressor station. Eight compressors, slightly smaller than those at the other two stations, will have a combined capacity of 12,320 hp. Cooling towers, water treatment plants, oil storage facilities, warehouses, garages, shops, and offices will add to the size of all three stations.

Construction is being handled by the Bechtel Corp., San Francisco, one of the firms which built the 502-mile Super Inch from the California-Arizona border to San Francisco.

FPC Grants Atlantic Gulf Proposal One More Chance

Atlantic Gulf Gas Co., Shreveport, is to be given a "final opportunity to show that it can meet the standards set out in the Natural Gas Act" at an FPC hearing scheduled to begin May 14 in Washington.

Proceedings on Atlantic's proposal to serve 53 communities and 22 industrial customers in Georgia, Florida, South Carolina, and Alabama have been repeatedly postponed since the original application was filed in April 1947. The commission advanced hearing dates twice at the company's request, and, after extensive hearings, FPC twice reopened the proceeding to permit the company to prove its case.

This time, says the commission, Atlantic Gulf "must introduce evidence of firm commitments for sufficient sales of its pipeline capacity to show convincingly that it is able to finance and construct the proposed facilities and that the project will be economically feasible." Atlantic has admitted that it has no contracts or firm commitments.

Current cost estimate for the 173-mile line is $98.7 million.

In a concurrent order, FPC dismissed an application of Southern Natural Gas Co., Birmingham, to serve substantially the same area. This plan was filed in March 1947 and was consolidated for hearing with Atlantic's proposal. During the hearings Southern Natural said it was not prepared to go forward with its showing but wished to remain in the proceedings.

TGT, United Natural File Underground Storage Plea

Another underground storage area will be developed soon if the Federal Power Commission okays the plan filed by Tennessee Gas Transmission Co., Houston, and United Natural Gas Co., Oil City, Pa., to build necessary facilities in the Hebron field, Potter county, Pa.

Included would be 70 wells and 70 well measuring stations, about 89,530 ft of pipe, and appurtenant facilities, to cost $7,757,200. When developed, the area could hold 22,500 MMcf of active gas and could deliver 225 MMcf per day. TGT also wants authority to inject some 23,800 MMcf of cushion gas.

Tennessee wants to use up to 200 MMcf per day from the field for present and proposed customers. (Northeastern Gas Transmission Co.'s proposed additional customers in New England would have received 194 MMcf of this amount, but that company's application has been denied by FPC, as reported elsewhere in this issue.)

United will use the storage facilities to furnish "safe, efficient, and uninterrupted service to its customers."

Gama Becomes Nicolet

Gama Industries Inc., New York, has announced a change of corporate name. The firm is now Nicolet Industries Inc., and its asbestos felt is known as Nicolet asbestos pipeline felt.

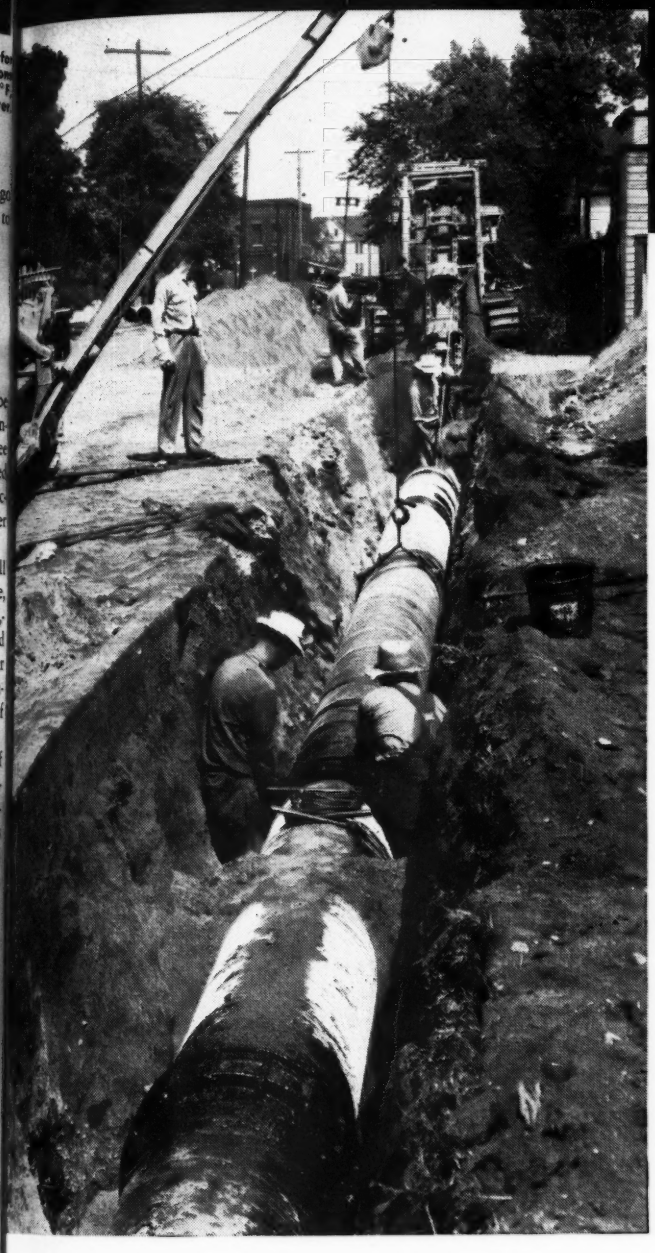
The asbestos fiber mines in Quebec, Canada, have always carried the name Nicolet Asbestos Mines Ltd., and it was decided to attach this identification to the product so consumers could associate the asbestos pipeline felt with its raw material source.

Middle West Coating & Supply Co., Tulsa, is distributor for Nicolet asbestos pipeline felt.

In Minneapolis . . .

647,656 feet of Dresser-Coupled steel mains

3″ thru 30″



Since changing over to natural gas, The Minneapolis Gas Co. has laid almost 123 miles of steel mains in sizes 3″ to 30″.

Dresser Couplings were used on all lines.

In its aggressive policy of bringing the benefits of gas to more people, this utility was quick to discover that Dresser Couplings make for speedy and economical pipe laying, and keep maintenance costs at a minimum.

When you use Dresser Couplings, pipe joining can keep right on the heels of the ditcher, and backfilling can follow immediately. No long traffic tie-ups, no stalling around because of weather.

And with Dressers, you get uniform joints that stay "Flexible-Tight"—permanently—even under the pounding of downtown traffic.

For complete information and expert follow-through, consult your Dresser Sales Engineer or write to our Bradford. Pa. headquarters.

DRESSER "FLEXIBLE-TIGHT" **COUPLINGS**

Dresser Manufacturing Division, 59 Fisher Ave., Bradford, Pa. (One of the Dresser Industries) • In Texas: 1121 Rothwell St., Houston
In Canada: 629 Adelaide St., W., Toronto, Ont. • Sales offices: New York, Chicago, Houston, San Francisco

Kansas-Nebraska Program Certificated by FPC

A $5,210,266 project which will increase system capacity of Kansas-Nebraska Natural Gas Co. Inc., Phillipsburg, Kan., by 18.2 MMcf daily has been approved by the Federal Power Commission.

Compressor stations at Holcomb and Albion, Kan. and Grand Island, Neb., with a total of 3570 hp; addition of 2000 hp at the firm's Palco, Kan. station; cooling equipment at its Scott City, Kan. station; and a 44-MMcf dehydration plant at the new Holcomb station are included.

Kansas-Nebraska also will build 515 miles of line in Kansas and Nebraska, 73½ miles of it to replace existing smaller diameter lines.

Twenty-seven Nebraska towns will be served at retail through the new facilities, and 10 towns will receive natural through wholesale deliveries to Central Electric & Gas Co.

Cinch Buys Out Coody

Cinch Pipe Line Equipment Inc., a new Texas corporation, has taken over the operations of the firm formerly known as Coody Bender Co. and is operating from a new plant at 7050 Long Drive, Houston.

Paul Barkley, formerly vice president and general manager of Coody Bender, is president of the new company. Other employees who are continuing with the new firm include Eddie Clavin, shop superintendent; Trent W. Avera, field service department; and Joe Guise Sr., in charge of shipping and supplies.

All Coody Bender stock was purchased by the new corporation last October.

El Paso Splits Application

Three applications of El Paso Natural Gas Co. have been filed with the Federal Power Commission, replacing the single plan originally submitted for enlargement of its Arizona-New Mexico distribution system and expansion to permit increased deliveries in California.

Expenditures estimated for the three proposals total $92,190,000. Included are $23,250,000 to make 100 MMcf available to its markets east of California; $51,720,000 for facilities to take an additional 200 MMcf to Pacific Lighting subsidiaries and Pacific Gas & Electric Co. in California; and $16,970,000 to increase deliveries to PG&E at Topock, Ariz. by 100 MMcf daily.

The aggregate of 300 MMcf additional daily gas for California is the same amount as originally proposed.

Disputed Gas Funds Paid

Pipeline company purchasers of Hugoton field gas recently were ordered by the Kansas Corporation Commission to distribute an impounded fund of about $7½ million to royalty holders and landowners.

The money, held by nine firms in trust and under bond as a result of a commission order of February 1949 which fixed the minimum price of gas from the field at 8 cents per Mcf, was to be distributed to about 8800 persons by April 1. Before the order, average contract field price was 5.35 cents per Mcf.

Three companies had appealed to the state supreme court, which upheld the commission's decision.

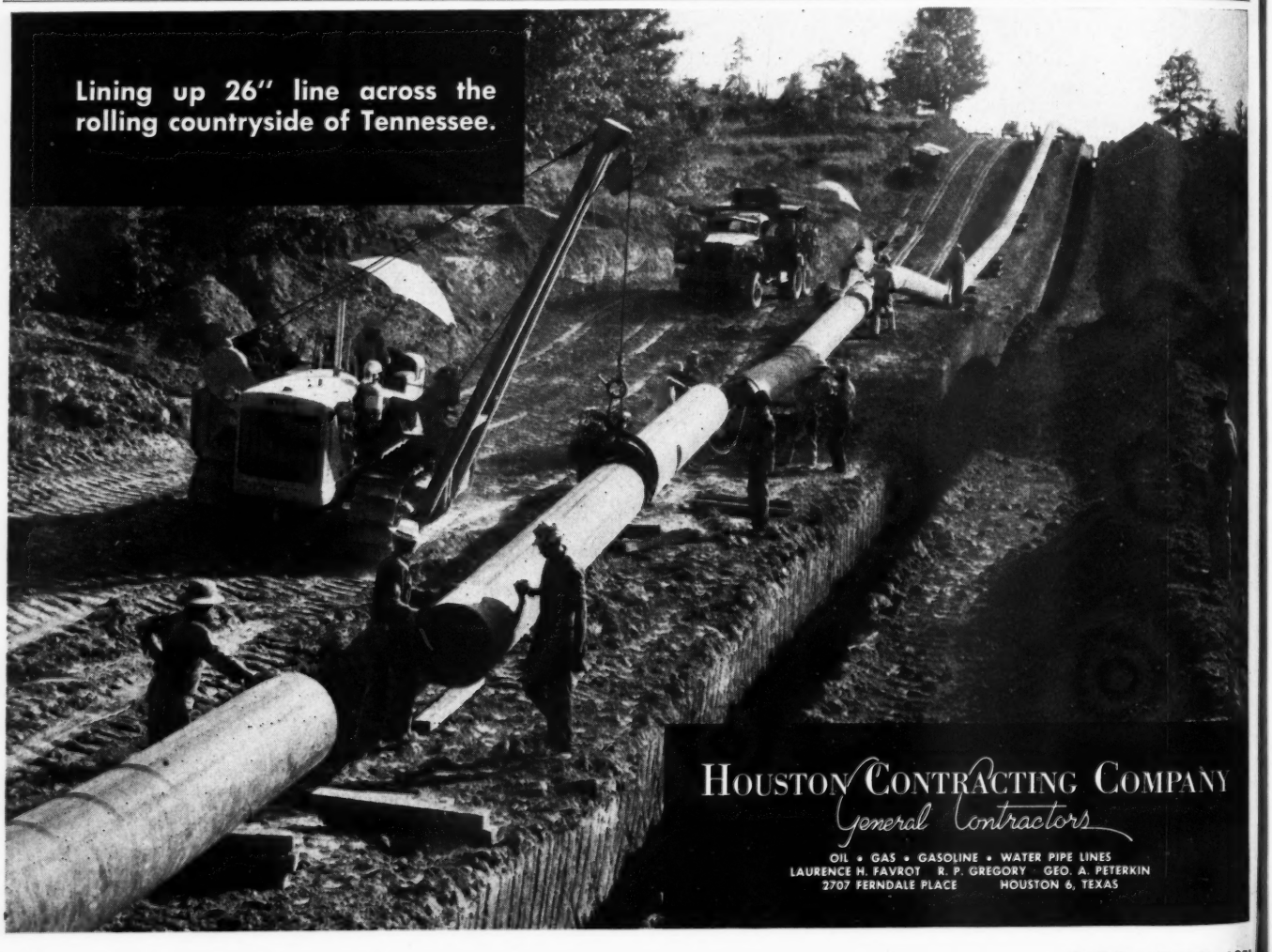
Carolina Natural Amends Application Again

A fourth amended application has been filed with the FPC by Carolina Natural Gas Corp., Charlotte, N. C., in its battle for the right to serve markets in North and South Carolina.

Following its approval of the proposal of Piedmont Natural Gas Co. Inc., Spartanburg, S. C., to serve certain Carolina markets, the commission allowed Carolina Natural and Public Service Co. of North Carolina Inc., Gastonia, to file amended plans, eliminating Piedmont's territory. Proceedings were reopened in late February.

Carolina Natural now proposes to build 185 miles of lines, extending from four connections with Transcontinental Gas Pipe Line Corp.'s main line, and having a total design capacity of about 48.5 MMcf per day. Estimated cost is $3,595,295.

Early in March, Carolina Natural's biggest potential customer — South Carolina Electric & Gas Co., Columbia — dropped out


Lining up 26" line across the rolling countryside of Tennessee.
HOUSTON CONTRACTING COMPANY
General Contractors
OIL • GAS • GASOLINE • WATER PIPE LINES
LAURENCE H. FAVROT R. P. GREGORY GEO. A. PETERKIN
2707 FERNDALE PLACE HOUSTON 6, TEXAS

of the pending case because it hesitated to convert its facilities without being assured an adequate supply of natural. A few days later, a Carolina Natural spokesman said the firm feels confident of FPC approval but will probably drop one of its proposed laterals, the one which would have served Columbia.

Michigan Company Seeks Share of Panhandle Gas

National Utilities Co. of (Coldwater) Michigan wants the Federal Power Commission to authorize construction of a 76.7-mile pipeline which would carry natural gas to the area it serves in south central Michigan, and to order Panhandle Eastern Pipe Line Co., Kansas City, Mo., to connect its system with the proposed facilities and to sell natural to National Utilities.

Connection with Panhandle's system would be near Marshall, extending 22.7 miles south to Coldwater. From there a 20-mile line would be built to Hillsdale and a 22½-mile line to Sturgis. In addition, a 5-mile section from Hillsdale to Jonesville and a 6½-mile line to Union City would be constructed.

The $1.5 million project would have a daily capacity of about 11 MMcf. Towns to be served, in addition to those mentioned above, are Bronson, Quincy, Tekonsha, and Burr Oak.

National Utilities presently serves Coldwater, Sturgis, Hillsdale, and Quincy with propane-air gas.

Transco's New Jersey Line Wins FPC Okay

FPC approval has been granted Transcontinental Gas Pipe Line Corp., Houston, for construction of a line extension in New Jersey and for addition of 5350 hp in six stations on its system.

Authorized horsepower at the six stations will be increased from 61,760 to 67,110 and, at the same time, estimated cost of the stations has been cut from $12,352,000 to $11,506,500. Temporary approval of the project was given in FPC orders of Oct. 18 and Nov. 6.

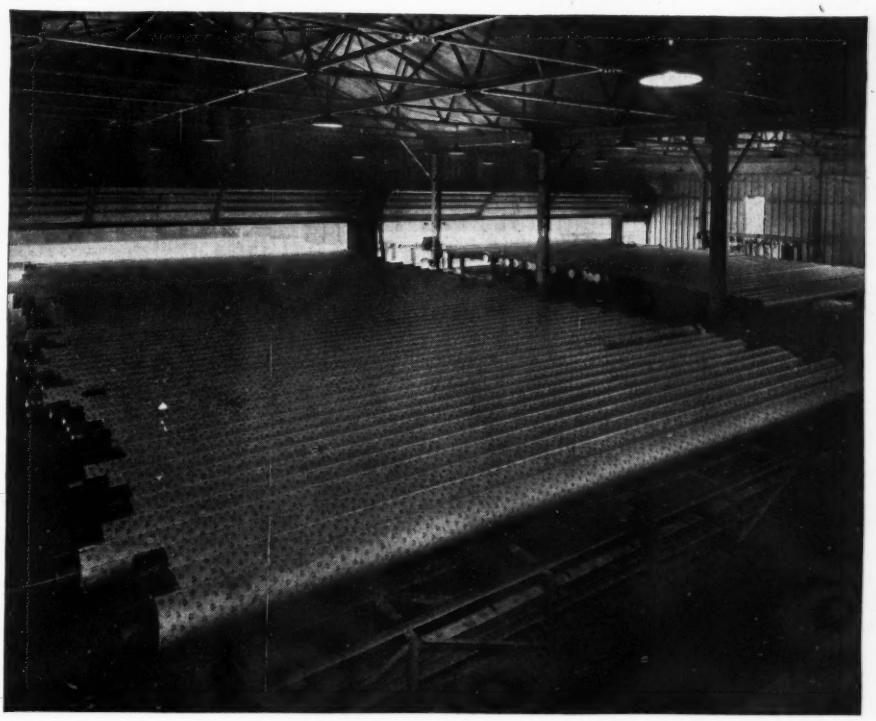
Newly authorized lines include 8½ miles of 30-in. and 8½ miles of 10¾-in. extending from Bergen county, N. J. to Public Service Electric & Gas Co.'s Paterson Gas Works. Cost of this sales lateral is estimated at $1,785,988.

Delivery and sale of the gas to be transported were previously authorized by the commission; engineering difficulties necessitated the change in facilities.

Oil and Gas Fight for Pipe

A tug-of-war in Washington between the oil and gas industries for allocations of steel pipe is bedeviling the gas pipeline business, President Claude A. Williams of Transcontinental Gas Pipe Line Corp., said last month.

Speaking before the National Federation of Security Analysts, Mr. Williams estimated needs of the oil industry in 1951 at 1.8 million tons, of the gas industry 1.5 million. He said neither industry would get all it wants, although a fair portion for each is probable.

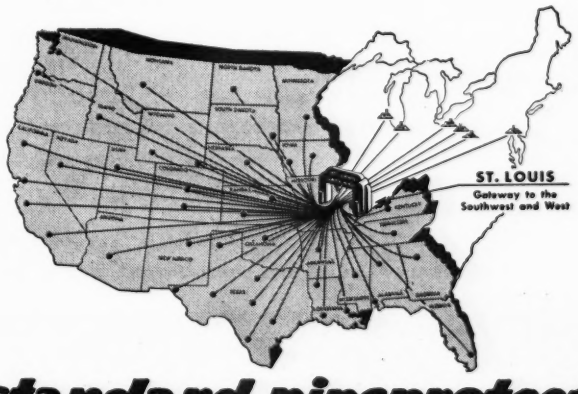


20,000 □'

FINAL INSPECTION AREA

STANDARD'S PROCEDURE . . . requires your coated and wrapped pipe to be electrically inspected . . . every piece . . . 20,000 sq. ft. area exclusively used for the industry's most modern final inspection . . . the pipe is moved to the loading area on canvas covered, sponge-rubber padded skids . . . long enough so that the applied coatings have more than enough time to properly cool, to prevent any thinning out or damage in handling and loading.

COATING AND WRAPPING-IN-TRANSIT . . . permits stop-off for processing or storage at St. Louis without freight penalty. When you ship through the St. Louis gateway, you enjoy "through freight rates" instead of the higher combination rates generally used.



New Catalogue just off the press . . . Write for copy.

standard pipeprotection inc.

3000 South Brentwood Blvd. • St. Louis 17, Missouri

Northern Natural Would Boost Output to 825 MMcf

Facilities which will increase by 225 MMcf per day the capacity of its system north of Kansas have been proposed by Northern Natural Gas Co., Omaha. FPC approval has been requested for facilities to cost $33,095,000 and to include some 222 miles of pipeline additions in Texas, Oklahoma, Kansas, Nebraska, and Minnesota, and 84,000 hp to be added to stations in Texas, Kansas, Nebraska, and Iowa.

The construction program would be carried out in order to increase system capacity in seven steps, to an ultimate 825 MMcf daily. About 17,725 Mcf of the increase will go to communities not now receiving natural; the balance will be used to supply additional contract demands requested by utility customers.

Northern Natural will file separate applications for authorization to serve the new communities.

United Gas Wins Approval For Offshore Line

United Gas Pipe Line Co., Shreveport, has been granted FPC approval of part of an application to build facilities in the Gulf of Mexico off the coast of Louisiana. A 12.3-mile, 14-in. line, to cost $1,279,657, w extend from Pure Oil Co.'s platform Block 32 to a platform operated by Ma nolia Petroleum Co., Continental Oil C and Newmont Oil Co. in Block 45.

The portion of the proposal which th commission denied would have authorize United to construct or acquire a second 14- mile section of line to another platform o erated by the three oil companies wh proved reserves in the offshore area rea 1 trillion cu ft. FPC said that evidence sho the presence of less than one-half trilli cu ft in the Magnolia fields, and that ca has not been shown for authorizing constru tion or acquisition of the second line this time.

New York Natural Would Add Line to Rochester

To enable New York State Natural G Corp., New York, to meet increased requi ments of present utility customers, the fi has asked FPC to authorize construction o 39-mile, 20-in. line in Pennsylvania a New York. Estimated to cost $2,093,70 the line would extend from a compres station in Potter county, Pa. to the bounda between Livingston and Monroe counti N. Y., and would parallel an existing li to a point near Rochester, N. Y.

New York State Natural plans to co struct 23 miles of the new line in 1951 a the remaining 16.1 miles in 1952 and 195 Capacity of the existing Rochester line about 75 MMcf daily; completion of the 2 mile line will permit delivery of 91.9 MM daily, the company stated. The extra 16 mi of line would enable the company to me the 117-MMcf peak load on the Roches line estimated for January 1954.

Penn Gas Files for Line

Pennsylvania Gas Co., Warren, is seeki FPC authorization to construct a 52-mi 12¾-in. line from Warren to a mixing pla in Erie, Pa. and to install five new compre sor units, three at its Roystone station Warren county and the others at the Sacke station in Elk county.

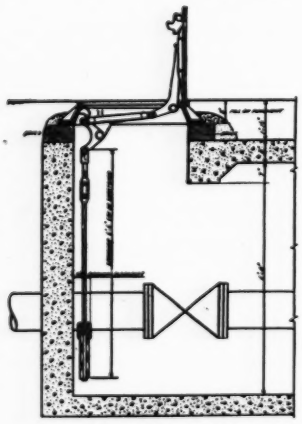
The new line, which is to parallel existin lines, would be used to augment supplies t Corry and Erie during the winter month and to carry gas to the company's storag areas during the summer.

Estimated cost is $2.2 million, to b financed by the sale of long-term notes t National Fuel Gas Co., Pennsylvania Gas parent.

Pipeline Newsnotes

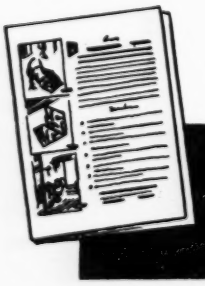
A third pipeline from natural gas fields i the Gulf Coast area to St. Louis is unde consideration by Mississippi River Fue Corp., St. Louis. Availability of the require 220,000 tons of steel was said to be a deter mining factor. The company now operate a 22-in. and a 24-in. line from Monroe, La About 60% of the gas transported by thes lines is sold to industrial plants; the balanc goes to utility customers.

A bill incorporating Trans - Canada Pipe



● The Wachs Safety Counterbalanced Vault Cover can be opened with ease and safety by one man. To open, merely insert the combination Key-Handle, give it a half turn and open the cover with one hand. The counterbalance weights that make lifting the cover a one handed job also hold it in an upright, protective position while a man is below. Designed and manufactured to withstand the heaviest traffic, many of these units have given trouble free service for over 40 years under the most rugged conditions. Several leading utility companies have had them in use for this period of time.

Write today for descriptive literature showing dimensions, weights, construction, prices, etc.



THE E. H. WACHS COMPANY
Manufacturers of Engines, Valves and Machinery since 1883
1525 NORTH DAYTON STREET · CHICAGO 22, ILLINOIS

Lines Ltd. was approved late in February by the Canadian senate's transportation and communications committee. The company wants to build a 2200-mile natural gas pipeline from Alberta to serve most major cities as far east as Montreal. Unless war demands intervene, the $250 million line would be started in the immediate future. The measure was sent back to the senate for final reading and still had to receive House of Commons approval.

Natural gas and petroleum in Alberta showed production and valuation gains during the 1949-50 fiscal year, as compared to the previous 12 months, according to figures released by H. P. Brownlee, provincial statistician. Production in 1949 totaled 67,095,204 Mcf, valued at $3,354,760; in 1950 production reached 75,578,509, valued at $3,778,925.

PIPELINE PEOPLE

M. F. GROOM, Rockwell Manufacturing Co.'s New Orleans manager for five years, and R. J. MUNN, who has been in charge at Corpus Christi, have been transferred to the company's Houston office. W. A. RANDLE was recently added to the sales force and will replace Mr. Munn at Corpus Christi. Mr. Groom's work will be mainly with gas transmission companies and several major oil companies.

M. F. Groom

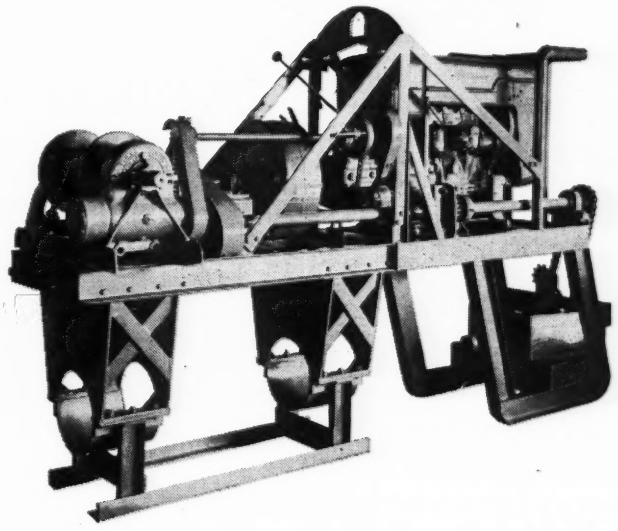
R. J. Munn

New general manager of Piedmont Natural Gas Co., Spartanburg, S. C., is LEE E. HURST, who recently resigned as vice president and general manager of Haverhill (Mass.) Gas Light Co. Mr. Hurst will supervise establishment of new Piedmont offices in North and South Carolina.

E. P. PRATER, an employee of Arkansas Louisiana Gas Co., Shreveport, has been promoted to field supervisor of gas measurement, gas pipeline department. He takes over the duties of the late WALTER A. BREWSTER.

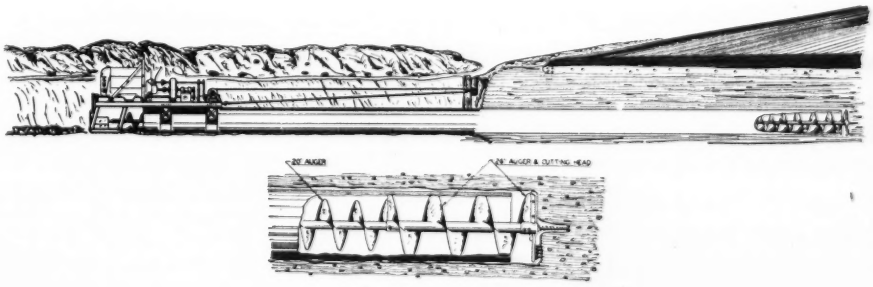
Election of L. LESTER SCHLOSSER as secretary of Michigan Consolidated Gas Co. and Austin Field Pipeline Co., was announced recently. Mr. Schlosser was formerly assistant secretary of the two companies.

Appointment of RUFORD MADERA as chief engineer of Republic Natural Gas Co., Dallas, was recently announced. Mr. Madera was formerly chief engineer for Shell Oil Co.'s west Texas division.



CROSE AUGER TYPE ROAD BORING MACHINE

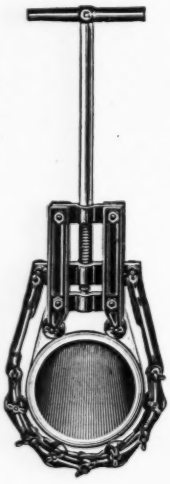
installs pipe casing up to and including 34″ in diameter. This machine has proven highly satisfactory with Pipe Line Contractors for the fastest method of installing pipe casing where rock is not encountered. Machines for installing casing larger than 34″ in diameter are also available.



M. J. CROSE MANUFACTURING COMPANY, INC.
2715 Dawson Road TULSA, OKLA. Phone 6-2173

ELLIS PIPE CUTTER

is the choice of pipeline men for cutting cast iron pipe in or out of the ditch.



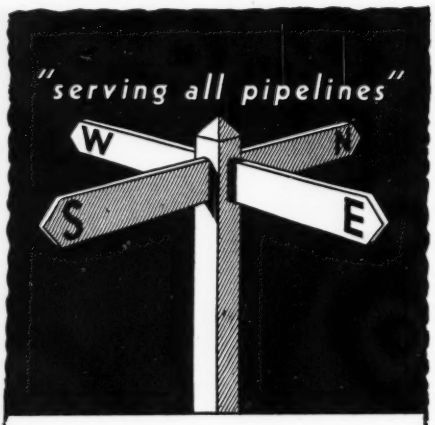
—And especially a time and labor saving tool in your conversion program.

No. 01 cuts pipe 4" to 8"

No. 1 cuts pipe 4" to 12"

Write for circular and price list No. 346 on our complete line of pipe cutting tools.

ELLIS & FORD MFG. CO.
FERNDALE 20, MICH.



PIPELINE COATINGS and WRAPPING MATERIALS

S. D. DAY COMPANY

1973 WEST GRAY HOUSTON, TEXAS PHONE JU-2431

Two recent appointments have been announced by Worthington Pump & Machinery Corp., Harrison, N. J. WILLIAM F. WEINREICH, former assistant superintendent of machine shops at the Buffalo plant, now heads the firm's new Oil City, Pa., plant. Mr.

A. W. Fraser

W. F. Weinreich

Weinreich is assistant to Austin C. Ross, who is in administrative charge of the Oil City plant, in addition to heading the Buffalo plant. A. WILLIAM FRASER, former general European manager, has been named Midwest sales manager of Worthington. He will direct sales of the St. Paul, Kansas City, St. Louis, and Chicago offices, headquartering in the latter city.

GRANT C. WOODARD, who for several years has been undergoing extensive sales engineering training at Cooper-Bessemer Corp.'s Mount Vernon, Ohio, plant, has been appointed to the company's field sales and engineering staff. Mr. Woodard will assist C. J. Michelson, who represents the firm in Michigan, Ohio, West Virginia, Kentucky, and Tennessee.

Wauwatosa, Wis., will be the headquarters city for PATRICK J. PATTON, newly appointed Milwaukee manager for the commercial sales division of De Laval Steam Turbine Co., Trenton, N. J.

EDWARD C. INGHRAM has been appointed superintendent of production and storage for New York State Natural Gas Corp., Pittsburgh. He will continue as superintendent of production and transmission for Peoples Natural Gas Co.

W. A. DISHEROON, former superintendent of Lone Star Gas Co.'s (Dallas) Benjamin compressor station, has assumed the same position at Snyder, Texas. P. J. HURD, formerly at the Waco station, has succeeded Mr. Disheroon.

CLIP THIS AND MAIL TODAY

IF YOU ARE NOT A REGULAR SUBSCRIBER TO **GAS**

In GAS each month you will find dozens of ideas that will help you know your business better and do your job better. Just one of these ideas coming to you on our pages can pay you many, many times the small cost of a subscription.

GAS 198 SOUTH ALVARADO ST.
LOS ANGELES 4, CALIFORNIA

Standard rates apply to U. S. and Possessions.
ALL OTHER COUNTRIES
1 Year $4.00 ☐
2 Years $7.00 ☐

Please enter my subscription to GAS for . . .

1 YEAR $2.00 ☐ 2 YEARS $3.00 ☐

☐ Check is enclosed ☐ Please bill me

COMPANY_____

NAME_____ POSITION_____

STREET CITY ZONE STATE

PROGRESS REPORTS

Planned

ARKANSAS-MISSOURI POWER CO., Blytheville, Ark. To build line from Big Inch to serve 12 towns in two states. To start within year.

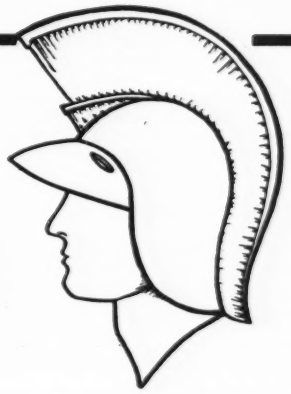
ATLANTIC GULF GAS CO., 1731 miles, Alabama to Florida, Georgia, South Carolina.

CAROLINA NATURAL GAS CORP., Charlotte, N. C., 185 miles, 4 lines, from Transcontinental Gas Pipe Line Corp. main line to North and South Carolina communities.

CITIES SERVICE GAS CO., Oklahoma City, for 56

On every job, we emphasize

Personal Supervision



Remember, when TROJAN handles your pipeline construction jobs, you get the full benefit of an organization of experienced personnel, ample equipment and financial stability.

TROJAN CONSTRUCTION CO.

INCORPORATED

Office: 1416½ North Robinson, Oklahoma City 9, Oklahoma • Phone 2-796 • Warehouse 1503 S.E. 29th, Phone 6-1430

MODERN EQUIPMENT • EFFICIENT PERSONNEL • FINANCIAL STABILITY

ANNOUNCEMENT

Manufacturers of

GAMA ASBESTOS PIPE LINE FELT

Announce a change of corporate name—from

GAMA INDUSTRIES, INC.

to

NICOLET INDUSTRIES, INC.

The Asbestos Felt will be known as

NICOLET ASBESTOS PIPE LINE FELT

Manufactured by:

NICOLET INDUSTRIES, INC.
(Formerly GAMA INDUSTRIES, INC.)
70 Pine Street New York 5, N. Y.

Distributed by:

MIDDLE WEST COATING & SUPPLY
207-A Daniel Bldg. Tulsa, Okla. Ph. 2-5215
P. O. Box 153 or 2-5216

miles of 16-, 10-, and 3-in. line in Kansas and 13,080 hp at new and old stations.

CITIZENS GAS CO., Stroudsburg, Pa., **BANGOR (PA.) GAS CO., PEN ARGYL GAS CO.,** subsidiaries of Penn Fuel Gas Inc., laterals to receive gas from Manufacturers Light & Heat Co.

CONSUMERS GAS CO., Toronto, Can., 85 miles, Buffalo to Toronto.

EAST OHIO GAS CO., Cleveland, 65-mile, 26-in. line from near Petersburg, Ohio, to Summit county.

EQUITABLE GAS CO., Pittsburgh, compressor station in Washington county, Pa. including 3300 hp, glycol dehydration plant, scrubbers, etc.

GEORGIA NATURAL GAS CO., Albany, Ga., Phenix City, Ala., to Tallahassee with laterals and branches, $5.1 million.

INTERSTATE POWER CO., Dubuque, Iowa. 26½-mile 8⅝-in. line to the Clinton, Iowa area. Includes a submarine crossing of the Rock river and a double submarine crossing of the Mississippi.

LYNCHBURG (VA.) GAS CO., 15-mile line from Transco's line in Appomatox county, Va., to Lynchburg.

MICHIGAN CONSOLIDATED GAS CO., 180-mile, 24-in. line paralleling present line from storage fields at Austin, Mich. to Detroit.

MICHIGAN GAS STORAGE CO., Jackson, for 78 miles of 16-, 22-, and 24-in. line from Laingsburg Junction to near Pontiac-Mt. Clemens, 3 laterals, 7400 hp, and 30 miles 26-in. loop. All for development of the Riverside storage field.

MISSOURI CENTRAL NATURAL GAS CO., Macon, Mo., 60 miles 6-in. from near Hannibal, Mo. to Macon.

MONTANA-DAKOTA UTILITIES CO., Minneapolis, interconnecting lines between facilities to be acquired from 3 companies in Montana and Wyoming. Compressor station with two 330-hp units and dehydration facilities.

NATIONAL UTILITIES CO. OF MICHIGAN, Coldwater, Mich., 77 miles in south central Michigan.

NEVADA NATURAL GAS PIPE LINE CO., 114 miles of 10¾-in. line from Topock, Ariz., to Las Vegas, Nev. Includes a 4-in. branch starting 4½ miles west of Boulder City and a 2½-in. branch from 2½ miles west of Needles into the city. To be finished early as possible in 1951.

NEW RIVER GAS CO., Radford, Va., 50-mile line from Atlantic Seaboard's system in W. Va. to a point near Radford with laterals to four towns.

NEW YORK STATE NATURAL GAS CORP., for a 77-mile, 20-in. line from Lawrence county, Pa. to the South Bend storage area, 17 miles of field lines, and a 12,000-hp station. Also a 39-mile 20-in. line from Potter county, Pa. to near Rochester, N. Y.

NIAGARA MOHAWK POWER CORP., Syracuse. Stub laterals and loop to serve Albany, Utica, and vicinities include 45 miles of 6- to 16-in.

NORTHERN INDIANA FUEL & LIGHT CO., Auburn, Ind., 31-mile, 8⅝-in. line to carry gas to northeastern Indiana. Cost: $511,315.

NORTHERN NATURAL GAS CO., Omaha, plans 222 miles of additions in Texas, Okla., Kan., Neb., and Minn., and 84,000 hp additions.

NORTHWEST NATURAL GAS CO., for 700 miles in Washington, Idaho, Oregon. Northern has awarded Tulsa Pipe Coating Co. a contract for a 198-mile gathering system to be started in the spring.

OHIO FUEL GAS CO., Columbus, for 74 miles storage project lines, 47½ miles 20-in. from proposed storage areas to markets, and 10,780 hp for storage service. In Ashland, Hocking, and Knox counties, Ohio.

OKLAHOMA NATURAL GAS CO., Tulsa, 40 miles of 16-in. from Ninnekah to Velma.

PACIFIC NORTHWEST PIPELINE CORP., 2175 miles of 26-in. from southern Texas to Seattle, Wash., Vancouver, B.C., via Oklahoma, Kansas, Colorado, Wyoming, Idaho, Oregon, Washington.

PENNSYLVANIA GAS CO., Warren, 52-mile 12¾-in. line from Warren to Erie, Pa. and 5 new compressor units.

PUBLIC SERVICE CO. OF COLORADO, pipeline from the Piceance Creek field in western Colorado to Grand Junction and Rifle.

PUBLIC SERVICE CO. OF NORTH CAROLINA INC., Gastonia, 168 miles of laterals connecting with Transcontinental main line in North and South Carolina.

SHENANDOAH GAS CO., Lynchburg, Va., for 49 miles from near Cedarville, Va., to cities in Virginia and West Virginia.

SOUTH ATLANTIC PIPE-LINES INC., Jacksonville, Fla., 254-mile line in Florida and 50 miles of laterals.

SOUTH CENTRAL ALABAMA NATURAL GAS CO. INC., 150-mile pipeline from a connection with Southern Natural's line in Elmore county.

SOUTH GEORGIA GAS CO., Atlanta, for 527 miles from northern Georgia into Florida to serve new markets in the two states.

SOUTHERN NATURAL GAS CO., Birmingham, 105 miles 10¾-in., Bolingbroke, Ga. to Aiken, S. C.; 19 miles 8⅝-in., 29 miles 12¾-in. Carthage, Texas, to Logansport, La.; 78 miles 14-in., Logansport to Perryville, La.; 40 miles 24-in. loops; 9000 hp in various compressor stations.

SOUTHWESTERN VIRGINIA GAS TRANSMISSION CO., Martinsville, 17-mile line from Transcon's line near N. C.-Va. state line to Martinsville.

TENNESSEE GAS TRANSMISSION CO., Houston, 45-mile spur from Buffalo, N. Y. to near Niagara Falls, N. Y. Also 266 miles loops between Texas & New York, 100 miles of laterals, 72,000 hp to be added, and crossing of Niagara river. To serve Manufacturers Light & Heat Co.: 25 miles 26-in. loop and 2000 hp along its Buffalo extension. To up capacity and develop a storage project: 438 miles of loop on New England & Buffalo extensions; 44,000 hp in existing or authorized stations, 14,000 hp in a new station. To serve Iroquois Gas, United Natural, and Equitable Gas: 253 miles loop; 61,000 hp; 100 miles miscellaneous lines.

Also a joint project with United Natural Gas Co., Oil City, Pa. for 89,530 ft of pipeline and appurtenant facilities to develop underground storage area in Potter county, Pa.

TEXAS GAS TRANSMISSION CORP., compressor station with 3960 hp on its main line near Shreveport. Also 564 miles main and loop in La., Ark., Miss., Tenn., and Ky. Includes 195-mile line from Acadia parish to Morehouse parish, La. (24- and 26-in.) and 369 miles 26-in. loops. Also 4400 hp near Madison, Ind.; 9340 hp at 4 existing stations; underwater crossings of Ohio & Mississippi. To develop the Alford storage field near Petersburg, Ind., a 12-mile line, 4½ miles field lines, a 1200-hp storage field station.

TRANS-CANADA PIPE LINES LTD., for a 2200-mile line from Alberta to major cities as far east as Montreal.

UNITED GAS PIPE LINE CO., Shreveport, for 50 miles in Ala. and Fla.

UTAH NATURAL GAS CO. to build a 360-mile line from the San Juan basin to Salt Lake City. A secondary line would run from Last Chance field (Wayne county, Utah) through Sevier and Sanpete counties.

same men, same tools do

4 days' work in 3

"New standard" Jaeger "Air-Plus" delivers 125 ft. of 100 lb. air, instead of 105 ft.
20 ft. more air per minute keeps 2 big breakers hitting at top pressure, instead of weak 70 lbs., increases their production 30% to 40%.

JAEGER "Air-Plus" COMPRESSORS

75 ft.
125 ft.
185 ft.
250 ft.
365 ft.
600 ft.

deliver 15% to 25% more air *at lowest cost per cubic foot of any compressors on the market,* to run today's tools at their full efficiency, greatly increasing your production with the same men and tools.

See your Jaeger distributor or send for Catalog.

THE JAEGER MACHINE COMPANY 661 Dublin Avenue Columbus 16, Ohio

PUMPS • MIXERS • HOISTS • TRUCK MIXERS • PAVING SPREADERS and FINISHERS

UTAH PIPE LINE CO., Dallas, for a 392-mile line from Aztec, N. M. to Salt Lake City. Includes 374 miles of 22-in. and 18 miles of 16-in.

VALLEY GAS PIPE LINE CO. INC., Houston, $144.5 million, 1000 miles of 30-in., from Hardin county, Texas, to southern Michigan, plus 500 miles of 24-in. in Texas and Louisiana, plus laterals, two 13,500-hp compressor stations, plus others aggregating 70,000 hp. Completion is scheduled for April 1, 1952.

WESTCOAST TRANSMISSION CO. INC., Wilmington, Del., 615 miles, including 277 miles from Sumas, Wash. to Portland, Ore. with short branches to a number of cities in the two states; 266 miles south from the Osoyoos, B. C. area to Spokane and Hanford, Wash.; and 72 miles of laterals and 13 measuring stations.

Approved

ALGONQUIN GAS TRANSMISSION CO., Boston, facilities to serve designated companies in Mass., R. I., Conn., and N. J. Includes 253 miles of main line and 279 miles of laterals.

CITIES OF BOONEVILLE, RIPLEY, BALDWYN, Miss., to connect with Tennessee main line in Benton county, 16 miles of 6-in., 23 more miles, 11-mile tap.

CITY OF TRINIDAD, COLO., a 35-mile, 8⅝-in. line from Colorado Interstate's facilities to a distribution system to be built in Trinidad.

KANSAS-NEBRASKA NATURAL GAS CO. INC., Phillipsburg, Kan. for 3 compressor stations at Holcomb & Albion, Kan. and Grand Island, Neb. totaling 3570 hp; extra 2000 hp at Palco station; cooling and dehydration equipment; replacement of 89½ miles of line with large pipe; 425½ miles new line.

LAKE SHORE PIPE LINE CO., Cleveland, Ohio, 45-mile, 10¾-in. line from Meadville, Pa. to Ashtabula, Ohio.

MISSISSIPPI RIVER FUEL CORP. for 4 miles 12-in. line and not more than 7 gas wells to test storage possibilities of Waterloo (Ill.) oil field.

NIAGARA MOHAWK POWER CORP., Syracuse, 55-mile, 10¾-in. line to supply Watertown and other communities.

NORTHEASTERN GAS TRANSMISSION CO., Boston, 400 miles of line from Tennessee Gas Transmission Co.'s system near Pittsfield, Mass. to Transcontinental's system near Greenwich, Conn. and metering and regulating facilities. To serve companies in Conn., Mass., and N. H. Includes 144 miles 24-in. from Pittsfield to Wakefield, Mass. to be built by Oklahoma Contracting Co.; 100 miles 16-in. from Greenwich, Conn. to Springfield, Mass. to be started Aug. 1 by Britton Contracting Co. Inc.; and 225 miles 3- to 12-in. laterals, and 35 meter stations, all to be constructed in 1951.

PIEDMONT NATURAL GAS CO. INC., Spartanburg, S. C., six laterals totaling 74 miles from Transcontinental main line to North and South Carolina cities.

SOUTHERN NATURAL GAS CO., Birmingham, 3½ miles of 24-in. loop on its main line in Carroll county, Ga. and 700 hp at its Tarrant compressor station.

TRANSCONTINENTAL GAS PIPE LINE CORP., Houston, 17 miles 30- and 10¾-in. from Bergen county, N. J. to Paterson, N. J.

TRANSCONTINENTAL GAS PIPE LINE CORP. for an 11-mile line from East Carteret, N. J. to Brooklyn. Also 45,675 hp in compressor capacity at existing stations and 41 sales meter stations.

UNITED GAS PIPE LINE CO., Shreveport, 1005 miles in Texas, Louisiana, and Mississippi. Includes 451 miles 30-in., 6 miles 26-in., 53 miles 24-in. from Agua Dulce field in south Texas to Monroe, La.; about 245 miles of 30, 26, 24, and 20-in. from Gulf of Mexico northeast to Jackson, Miss.; 215 miles from this line to near Kosciusko, Miss.; 24 miles 8, 12, and 16-in. in south Louisiana; 16 miles of 16-in. from Koran gasoline plant site, La., to its Carthage-Sterlington line in Louisiana; 4000-hp compressor, dehydration plant. Contracts have been awarded to Brown & Root Inc., Houston, for engineering, construction, and other services and to Gulf-Southern Contractors, Fort Worth, for other major work on the project. In offshore fields in Gulf of Mexico: 12.3 miles 14-in. line.

Under Way

CITY OF FLORENCE, ALA. has Modern Welding Co. Inc., Owensboro, Ky., at work on 84 miles of 1- to 8-in. city system and 50 miles service lines, 2 regulator stations. 11 miles completed.

COLORADO INTERSTATE GAS CO., Colorado Springs, a 215-mile, 20-in. line from the Texas Panhandle to Colorado.

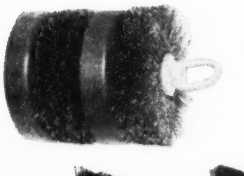
EL PASO NATURAL GAS CO., to increase deliveries to Phoenix, Ariz., 31 miles 16- and 10-in.; 11.5 miles 4½-in.; 5.5 miles 12¾-in.; six metering and regulating stations. To increase system capacity by 400 MMcf, 93 miles 26 & 30-in. loop between Permian basin & Ariz.-Calif. state line; 180,850 hp in new & existing stations; 311 miles in its field system; 42,370 hp in field stations, and appurtenant facilities.

HUGOTON PRODUCTION CO. has Reese Bros. Construction Co., Hugoton, Kan. at work on a 40-mile, 4- to 20-in. gathering system near Ulysses, Kan.

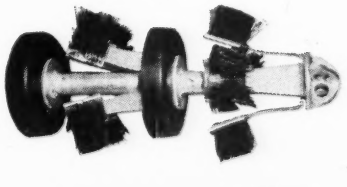
NEW YORK STATE NATURAL GAS CORP., New York, 164 miles of 16-in. from Dryden to Albany, N. Y.; 56-mile line from Dryden terminus to a storage pool in Tioga county, Pa.; facilities for a new storage pool. Also 44½ miles of 16- and 18-in. to connect the Leidy gas field with its system in Penn. Williams Austin Co., Pittsburgh, is at work on 4½ miles 20-in. in South Bend

THE PIG WITH THE POKE — CLEANS PIPE LINES

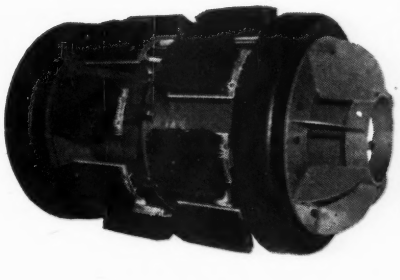
THE VERY LATEST
Williamson Pipe Line Pigs*
FOR CLEANING
NATURAL GAS PIPE LINES



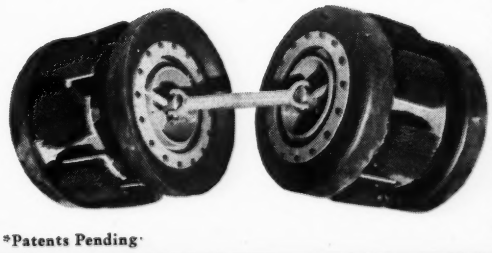
4" Size—TYPE JRN—2" to 4" sizes. Will pass 1½ R-90° Bends. No valves other than full diameter thru port valves. Use TYPE SCN-51 for 6" size.



8" Size - TYPE WC-11 - 8" to 14". Will traverse 6-foot radius field bends, full diameter side openings at 45°. SPRINGS COMPENSATE for BRUSH WEAR.



20" Size - TYPE GP-2 - 16" to 30" 200-lb. SPRING forces the brushes against pipe wall — COMPENSATING for WEAR. Will traverse round opening gate or plug valves. SPRINGS and BRUSHES are identical and interchangeable for all types and sizes of GP-PIGS.



24" Size - GP-3 - 18" to 30". Sizes will pass 1½ R-30° Bends. SPRINGS COMPENSATE for BRUSH WEAR ASSURING full section cleaning efficiency.

GP-3 consists of two Type GP-1 Pigs— Each Unit may be used as individual pig.

*Patents Pending

T. D. Williamson, Inc.
TULSA 9, OKLAHOMA

INDEX TO ADVERTISERS

American Blower Corp. 85
American Meter Co. 9
American Radiator & Standard Sanitary Corp. 61
American Recording Chart Co. —
Anchor Petroleum Co. —

Barrett Division, The —
Blaw-Knox Co. —
Bryant Heater Division 63
Bucyrus-Erie Co. —

Caloric Stove Corp. 69
Carbide & Carbon Chemicals Division, Union Carbide & Carbon Corp. —
Cast Iron Pipe Research Assn. 20, 21
Chaplin-Fulton Manufacturing Co. 13
Cleveland Trencher Co., The 27
Columbia Gas System, Inc. —
Commonwealth Services, Inc. —
Connelly, Inc. 83
Consolidated Engineering Corp. 80
Cooper-Bessemer Corp., The 110, 111
Crane Co. 8
Crane Packing Co. 68
Cribben & Sexton Co. 70
Crose Manufacturing Co., M. J. 117

Day Co., S. D. 118
Delco Appliance Division General Motors Corp. 59
Detectron Co., The 90
Detroit Brass & Malleable Works 76
Detroit Michigan Stove Co. —
Detroit Regulator Co. 86
Dowell, Inc. —
Drake & Townsend —
Dresser Industries, Inc. 81, 113
Dresser Manufacturing Division 113

Ebasco Services, Inc. 107
Ellis and Ford Mfg. Co. 118
Empire Stove 65
Evans Sales Co., G. S. 87

Fisher Governor Co. Third Cover
Fisher Research Laboratory, Inc. 92
Fluor Corp., Ltd. 91, 98, 99

Gas Machinery Co., The —
General American Transportation 3
General Electric Co. —
Glass Fibers, Inc. 100
Greene, Gordon Z. 30
Greenlee Tool Co. 88

Hamilton Manufacturing Co. —
Hardwick Stove Co. —
Hays Manufacturing Co. 74
Heatbath Appliances, Inc. —
Heath Tree Service, Inc. 91
Houston Contracting Co. 114
Hydrauger Corp, Ltd. 89

Ingersoll-Rand Co. 7

Jaeger Machine Co., The 120
Johns-Manville Corp. —

Kaiser Steel Corp. 97
Kitson Division, The Welsbach Corp. 82
Koppers Co., Inc. 10, 16

Lancaster Meter Parts Co. 6
Longhorn Industries 57

McCabe Powers Auto Body Co. —
Mettler Co., The —
Middle West Coating & Supply Co. —

Minneapolis-Honeywell Regulator Co. 66, 67
Milwaukee Gas Specialty Co. —
Mueller Company 79

National Radiator Co. —
National Tube Co. —
Natural Gas Odorizing Co. —
Nicolet Industries, Inc. 119
Nordstrom Valve Division Rockwell Manufacturing Co. 4, 5
Norton-McMurray Manufacturing Co. 72, 73
Norwalk Valve Co. 91

Oil Well Supply Co. —
Oronite Chemical Co. 75

Peerless Manufacturing Co. —
Peerless Manufacturing Corp. 89
Pewthers Ditcher Co. 12
Phillips Petroleum Co. 11
Price Co., H. C. —

Rector Well Equipment Co. 90
Reliance Regulator Division Second Cover
Refinery Supply Co. 22
Republic Steel Corp. 94
Reynolds Gas Regulator Co. 78
Robertshaw-Fulton Controls Co. Front Cover
Rockwell Manufacturing Co. 1, 17, 18
Roots-Connersville Blower Corp. 81
Roper Corp., Geo. D. —

Safety Gas Main Stopper Co. 90
Security Manufacturing Co. —
Selas Corp. of America —
Semet-Solvay Engineering Division —
Servel, Inc. 77
Sharples Chemicals Inc. —
Skinner Co., M. B. 103
Smith Corp., A. O. 24
Smith, O. R. —
Sprague Meter Co. Fourth Cover
Stacey Manufacturing Co., The 86
Standard Pipeprotection, Inc. 115
Stauffer Manufacturing Co. 84
Surface Combustion Corp. —

Thermac Co. 85
Thomas & Associates, Inc. H. Emerson 92
Titan Valve & Manufacturing Co. —
Toledo Pipe Threading Machine Co. —
Tractor Sales Corp. 14
Trojan Construction Co. 119
Trojan Mfg. Company 84
Tulsa Pipe Coating Co. —

U. S. Pipe & Foundry Co. 15
Union Carbide & Carbon Corp., Carbide & Carbon Chemials Division —
United Engineers & Constructors, Inc. 109
United Petroleum Gas Co. 92
United States Steel —
Utility Clamp & Equipment Co. 28
Utility Control Co. 85

Vulcan Rubber Products, Inc. 19

Wachs, E. H. Co., The 116
Ward Heater Co. —
Warren Petroleum Corp. 91
Webster Engineering Co. —
Welsbach Corp., The 82
White-Rodgers Electric Co. —
Williamson, Inc., T. D. 121

storage field area; will build 37 miles from there to Ithaca and 23 miles to Angelica, N. Y. Also 82½ miles 20-in. from Utica to Ithaca and 85 miles 16-in. from Utica to Albany. These projects will be completed during 1951.

NIAGARA MOHAWK POWER CORP., Syracuse, Williams-Austin Co., Pittsburgh, is at work on 40 miles of 10-, 12-, and 16-in. laterals and will build 55 miles of 10-in. from Fulton to Watertown, N. Y. as soon as pipe is delivered.

OKLAHOMA NATURAL GAS CO. has Tulsa Pipe Coating at work on 40 miles 16-in. from Chickasha to Velma, Okla.

PANHANDLE EASTERN PIPE LINE CO., Kansas City, has Conyes Construction Co. at work on 129 miles 30-in. Ill.-Ind. loop line; Anderson Bros. Inc. on 43 miles 26-in. loop in Mich.; Midwestern Constructors on 3 compressor station additions.

SOUTHERN CALIFORNIA GAS CO. and **SOUTHERN COUNTIES GAS CO.,** Los Angeles, on their 20- and 22-in. loop line from the Goleta dry gas field to L. A. SoCounties will complete its section in 1951 with a line from near Summerland to Goleta. SoCal will build a 21-mile loop from the Santa Clara river to the Simi tie-in.

TENNESSEE GAS TRANSMISSION CO., Houston, 303-mile extension from Erie county, N.Y. to N.Y.-Mass. line; 787 miles of loop along existing or authorized line from Texas to Buffalo; 111,680 hp in existing, authorized, or new compressor stations; 75 miles of laterals.

TEXAS EASTERN TRANSMISSION CORP., Shreveport, to boost capacity to 476 MMcf, 791 miles 30-in. from Kosciusko, Miss., to Connellsville, Pa.; seven compressor stations with 46,400 hp on new line, six with 52,500 hp on existing line; short lines in New York area.

TEXAS EASTERN TRANSMISSION CORP., Shreveport, has Mahoney Contracting Co. at work on 35 miles of 30-in. from Fayette county, Pa., to Westmoreland county, Pa.

TEXAS-ILLINOIS NATURAL GAS PIPELINE CO., Chicago, on its 1331-mile line, Midwestern Constructors Inc., 100 miles of 30-in. from Mississippi river near Chester, Ill. to Effingham, Ill., 28% completed; 92 miles 30-in. from Sibley to Joliet, Ill.; and 100 miles 30-in. from Effingham to Sibley; crossing of the Illinois river near Morris, Ill. 90% completed. Bechtel Corp. under way on 106 miles 30-in. from Texas-Ark. line to Malvern, Ark. and 74 miles 30-in. from Newport to Moark, Ark. To be completed August 1951. Parkhill Truck Co. stringing for Bechtel and Midwestern. Fish Constructors Inc., Houston, is building compressor stations. H. C. Price Co. at work on right-of-way for 200 miles 30-in. from Trinity river to Texarkana.

TRUNKLINE GAS CO., Houston, has Anderson Bros. Corp., also of Houston, at work on 180 miles, 26-in., Darnell to Senatobia, Miss., and 217 miles 24-in. Longville to Garwood, Texas. Parkhill Truck Co. stringing above jobs. On 740-mile, Louisiana-to-Illinois line, R. H. Fulton, Lubbock, Texas, is working on 278 miles of 12- and 20-in. and 184 miles of 26-in. Mahoney Contracting Co. under way on 186 miles of 26-in. 50% completed. Four major river crossings to be made under Mississippi, Ohio, Washita, and Red rivers. Anderson Bros. have contract for the first, J. Ray McDermott & Co. for the other three. Project will include six other river crossings for which contracts are not let.

UNION GAS CO OF CANADA, LTD. Shaw Construction Co., Sarnia, Ont., building a 16-in. line extending 61 miles from Windsor, Ont., to Dawn township. Includes dual crossings of the Thames and Sydenham rivers. 10 miles completed.

UNION GAS & ELECTRIC CO., Bloomington, Ill. has J. L. Cox & Son at work on 32 miles of 8-in. from Bloomington to Farmer City.

UNITED FUEL GAS CO., Charleston, W. Va., 55 miles, 6540-hp compressor stations to deliver gas to storage pools in West Virginia.

WESTERN KENTUCKY GAS CO. has Modern Welding Co. Inc. building 3 miles of 4- and 6-in. line in Owensboro, Ky.